In This Issue—*The Garage in Architecture*

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MOTOR AGE

Volume XXXVII
Number ~~18~~ 19

PUBLISHED WEEKLY AT THE MALLERS BUILDING
CHICAGO, MAY 6, 1920

Thirty-five Cents a Copy
Three Dollars a Year

Hudson Has Outsold All Fine Cars for 5 Years

Since the Super-Six was brought out nearly five years ago, Hudson has led all the world's fine cars in sales.

Yet the most desirable thing in connection with a Hudson franchise is not just the volume of sale and the profits that you take today.

Hudson permanency is an even stronger appeal. Ninety-seven per cent of Hudson's production is handled through men whose connection is seven years or more.

Thus a franchise, developed by the dealer, becomes a genuine and permanent property.

We believe this is the chief value of a Hudson dealership. It has proved the most profitable policy for Hudson. And the corollary is the prosperity of Hudson dealers everywhere.

Their prosperity is visible. Their salesrooms are the show places of the business. Their status in any community proclaims them men of substance and standing.

We could have no such excellent dealer organization were it not for the exercise of the most careful selection. It is not easy to get a Hudson franchise. But once secured the confidence and assistance of a great organization is at your back. And you know that your efforts are going into the construction of a business that belongs to you and that cannot be wiped out by a whim of reorganization.

If you want a business with orders booked ahead, with an assurance of permanency and with the prestige all Hudson dealers share, you would do well to investigate the opportunity to secure a Hudson franchise.

Hudson Motor Car Company — **Detroit, Michigan**

(H-5)

Entered as second-class matter Sept. 19, 1899, at the post office at Chicago, Ill., under act of March 3, 1879.

UTILITY Safety Gauge TIRE PUMPS

—are a seasonable seller worthy of your most careful attention.

Gearless—they have to recommend them from the start, this most important mechanical feature, the secret of long life and service. And they can be attached to ANY car, in any spark plug opening, by anyone.

Automatic—they cannot over or under inflate any tire, because a **guaranteed accurate automatic gauge** is part of the equipment. The UTILITY Safety Gauge Tire Pump pumps tires **exactly** to the proper pressure—no more, no less.

Demand—sells them. $7.50 for Fords—$12.00 for other cars. **Needed by millions—and sold** in proportion. The **choice** of 1920 car owners, who have learned from experience the particular value of the Utility type of Tire Pumps.

Dealers order from your jobber. Jobbers get in touch with us as other jobbers are doing every day. A big UTILITY Safety Gauge Tire Pump season is here.

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Mfrs. of UTILITY Protected Heaters, UTILITY Pedals for **Fords**, UTILITY Pumps, UTILITY **Universal** Rim Wrenches and UTILITY Universal Wrenches.

Belmont and Knox Avenues **CHICAGO**

SALES DEPARTMENT

THE ZINKE CO. **1323 S. Michigan Avenue, Chicago**

MOTOR AGE

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THE COMPLETE OUTFIT

Thousands of dealers are saying that and backing it up by constantly increasing the size of their orders for

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ALL RUBBER SELF CURING PATCH

Forms a permanent and immediate repair for all punctures and blowouts in tubes. Simple, quick and easy to use. Once put on, it sticks to the tube forever. It cures itself—requires no heat or acid. Fills every requirement for an efficient tube patch.

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Dealers:
Send for 1920 Catalog, illustrates the entire Dutch Brand line.

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Why Did Velie Concentrate A Great Factory On This One Truck?

Speed and Capacity for widest range of Merchandise

FOR 10 years the Velie built heavy duty trucks. Today all resources of the big Velie Truck factory are devoted to one model only—the new Ton-and-a-half that is winning the truck market wherever demonstrated. Why?

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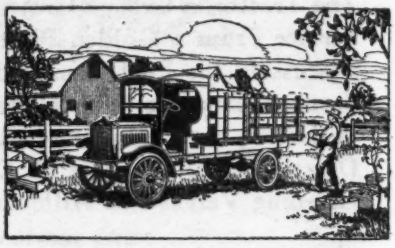
It is the wonder of truckdom. The first truck that brings out all the possibilities of pneumatic equipment. Can do 25 miles an hour fully loaded. New strength! New power. Longer truck life. ***It is here—now! Let us show you.*** Bodies furnished for every use. Solid or pneumatic equipment.

With the new Velie Ton-and-a-half you cover by far the widest range of the truck market—the most profitable market—with an immediate tremendous demand. If your territory is not closed we suggest that you get in touch with us at once.



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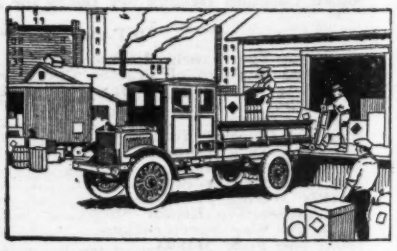

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Builders of Automobiles and Ton-and-a-half Trucks

Velie

Vol. XXXVII. No. 19 CHICAGO, MAY 6, 1920 $3.00 Per Year

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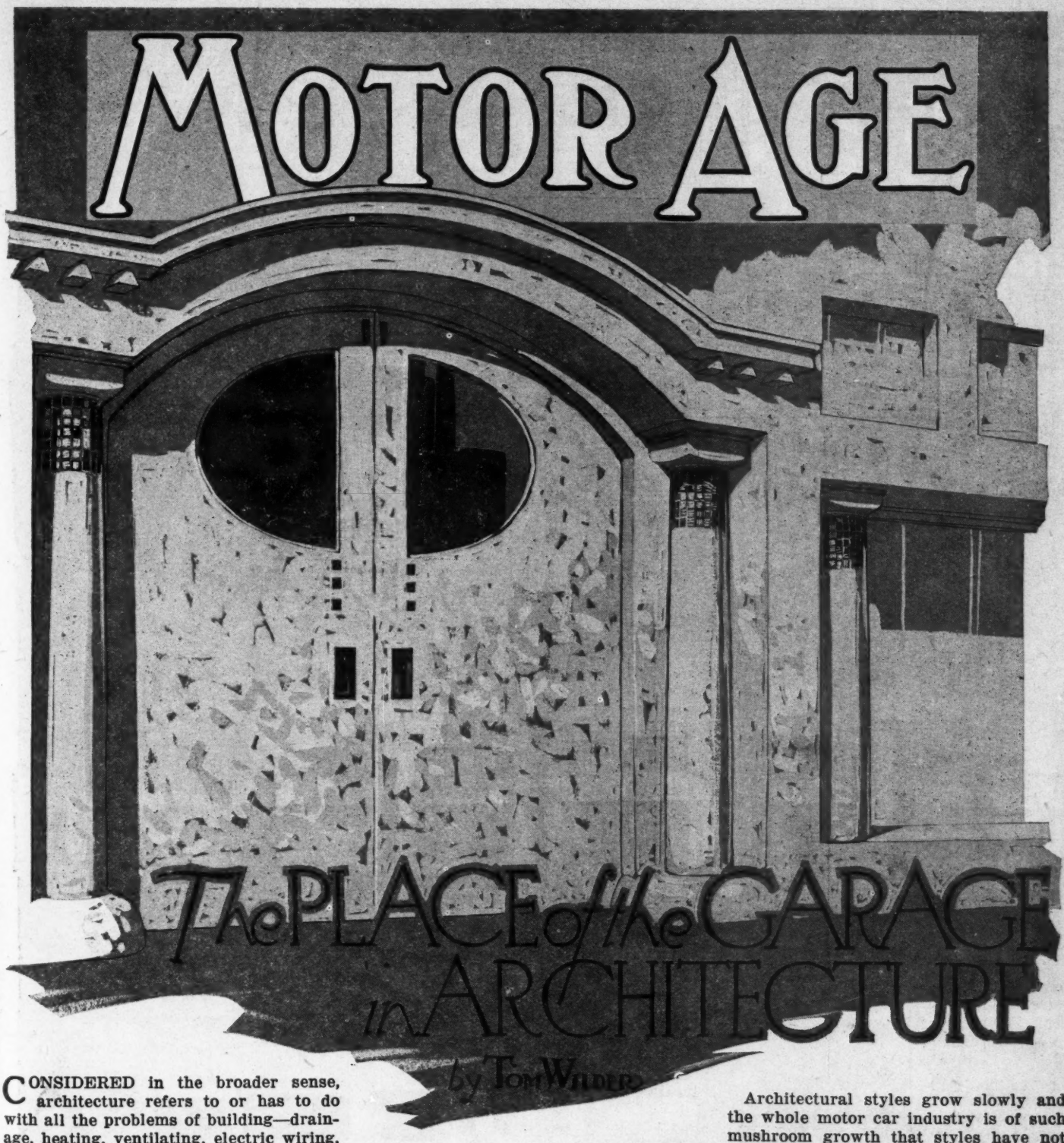


The PLACE of the GARAGE in ARCHITECTURE

by Tom Wilder

No doubt most readers of the above title will bat an eyelash, make a mental protest against the "highbrow stuff" and turn to more interesting fields. Nevertheless, those of us who have building problems always are fans temporarily, at least, on the refined or unrefined art of architecture, and for such these lines are penned.

CONSIDERED in the broader sense, architecture refers to or has to do with all the problems of building—drainage, heating, ventilating, electric wiring, general construction, design, and in fact, with everything that goes to make up a building from the time excavation is started until the job is turned over to the owner. When we speak of its place in architecture, however, we refer to architecture in its original sense—before it was beset by such modern troubles as plumbing and electric wiring—as one of the Arts, spelled with a capital A, and exemplified in the art of all the masters from the unknown Greeks, down through the years, to our own time.

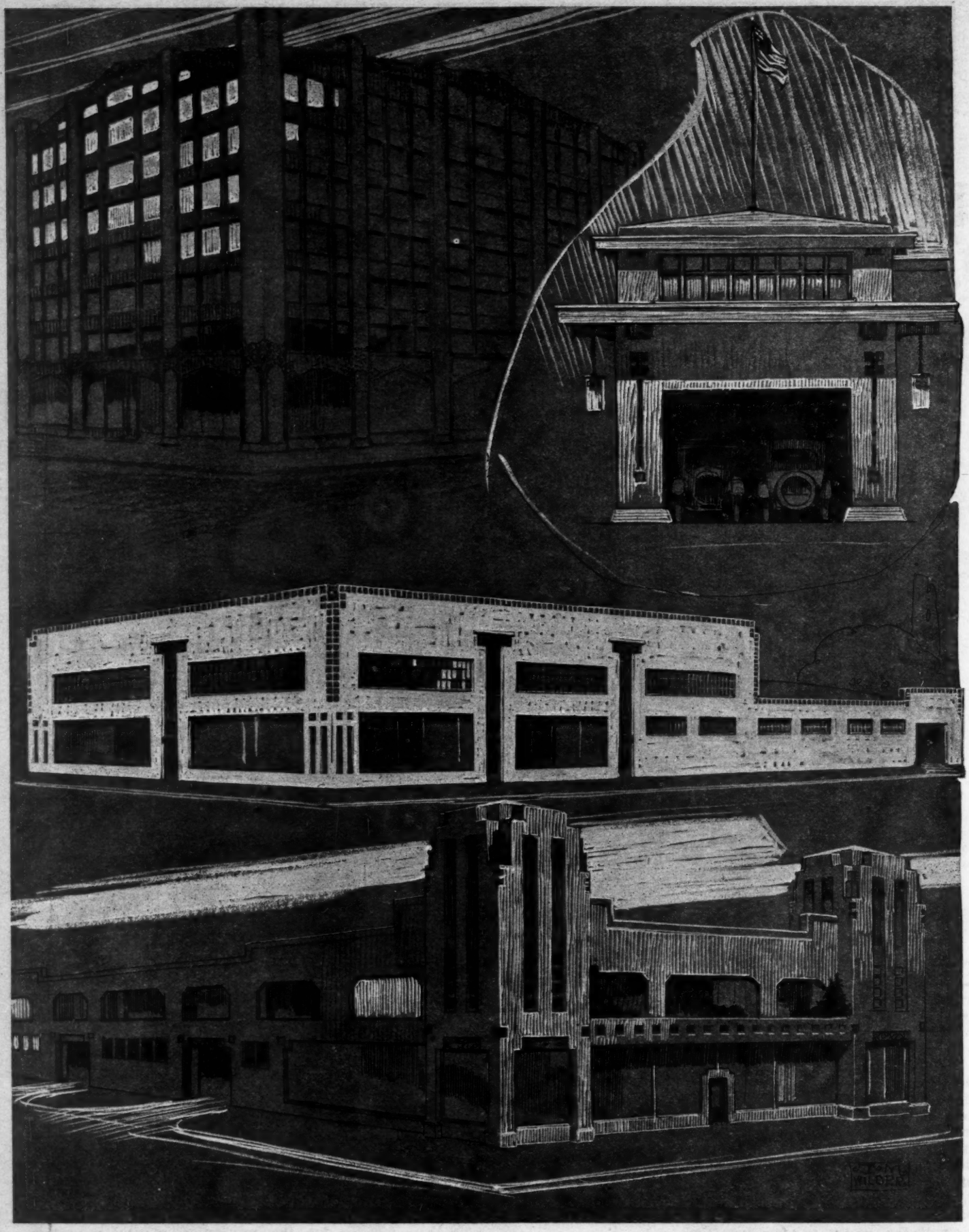
In a word, we refer to the design and selection of material and all the part of the work which goes to make up its external appearance.

In this sense, then, when we think of the place of the Garage in Architecture we really "haff to laff" for there is in reality no such thing as Garage Architecture.

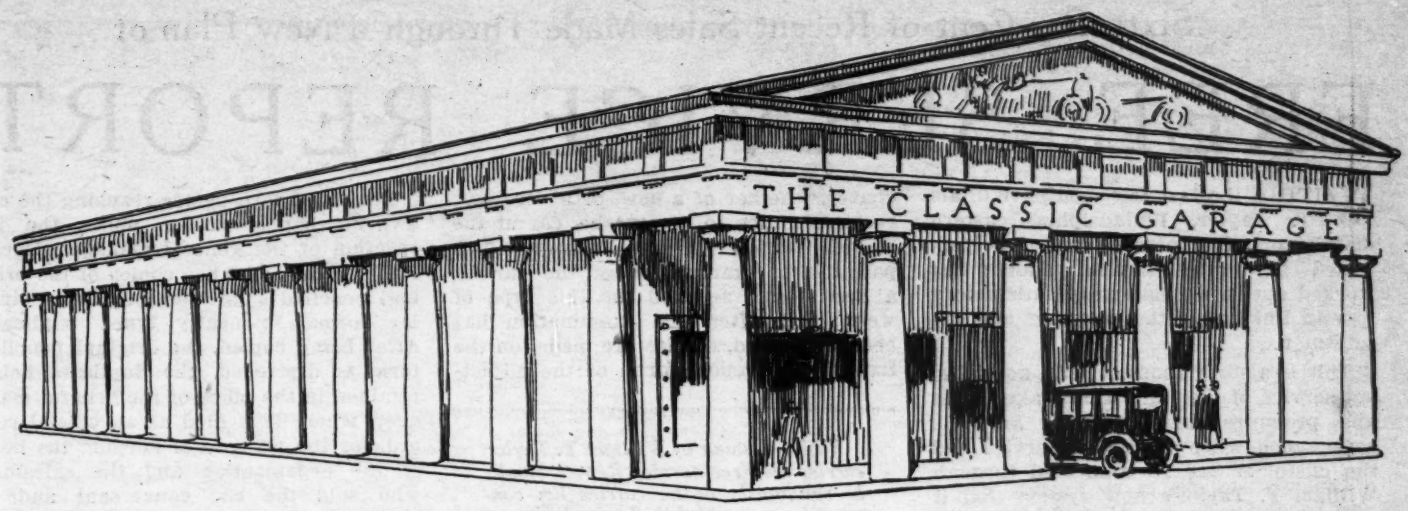
Architectural styles grow slowly and the whole motor car industry is of such mushroom growth that styles have not developed during its brief existence. About all we have is a cross between the modern store front and its contemporary, the factory.

All of the great styles of the past have been created, or we might say, generated by public movements, either religious or economic. Reverence for their gods incited the Greek architects to produce their wonderful temples which for simplicity and refinement have never been equaled. Christianity was the incentive for the production of the marvelous gothic churches of the twelfth to sixteenth centuries. The Renaissance was given us as a result of growth in importance of governmental institutions and the necessity of more appropriate housing.

All through the past century the classic styles have been brought forward, treated with the pulmotor and smeared at ran-



The sketches shown on this page are not intended to represent any new ideas in garage architecture but are given more as suggestions showing the trend of modern architecture and its possible application to the garage. They give a graphic idea of what the architect may accomplish if allowed a free rein. They are not necessarily expensive, in fact the center one could be constructed very inexpensively



While a Greek temple is very well adapted to use as a garage the expense of construction in these days of high prices would be excessive. The columns alone would cost more than the ordinary garage complete. Then, too, we do not care for the associaton of the Greek and the motor car; they are too incongruous

dom over our public buildings in ways that are thoroughly inappropriate as well as unfitted to modern requirements. A Greek temple would be much more suitable for a garage than a county court house and jail, though we protest against this use of the Greek and advocate a more modern treatment for such an extremely modern institution as the garage.

An industry which controls the efforts of over 15,000,000 of the American people ought to exert enough influence to create something better than the present type of garage architecture. The industry has the money to spend but examples are lacking; and architects, if they are employed at all, are wary about making suggestions aside from utility.

All Styles Based on Utility

All styles in architecture, naturally, are based upon utility. The American Indian leaves a hole in the top of his tepee to let the smoke out; he also builds it with collapsible features for easy transportation from place to place. The Kansas farmer plays safe with his cyclone cellar, and the rabbit has two entrances to his burrows for easy escape. So garage architecture must be fitted to its use or in time perish. Neither could the Indian afford the Greek temple nor the Kansas farmer afford to build his house and barn in such solid form as to resist the destructive tornado.

The Indian can and does beautify his humble abode with decorations and picture writing, merely to satisfy himself and make his establishment a little more attractive than that of his neighbor, thus adding to his prestige.

It is high time for the garage builder to look a little beyond utility. He has no religious zeal to spur him on like the early Christians, or the Greeks; but he has, or should have, pride and an insight into the advertising advantages to be gained from a beautiful or at least attractive building. Leaving the service station out of the discussion, as it partakes more of the nature of a factory, there is good opportunity for the play of imagination along the lines that modern architecture is running. The long low lines of the conventional one-story building, especially the one located on a corner, offers very attractive conditions, to the architect while the more pretentious city sales establishment is even more of an opportunity to obtain beauty.

AFTER a complete summing up of the conditions and requisites one is convinced that the modern is for the modern. That an industry so modern as ours should be housed in buildings of modern design, construction and character. That the best is none too good; and we should all boost for the improvement of garage architecture

It is an open question whether an investment in style is one that will pay dividends. We do not hesitate to spend several hundred dollars in an electric sign and, perhaps, pay another hundred dollars a month for current to maintain it. We charge this to advertising and consider it a paying expenditure.

Why should not an investment in architecture, that would not exceed the cost of an electric sign, and chargeable to advertising if necessary, be a good one? The added prestige alone is valuable.

There can be no doubt that a beautiful building is a decided advantage. When one walks down "Motor Row" in any large city, a stranger to the concerns there doing business, and sees a beautifully-designed building, he immediately places it among the more prosperous of the group, while the plain and unattractive buildings are classed among those of doubtful stability.

A building is to a business just what a suit of clothes is to a man. While some of our greatest men have gone through life shabbily clothed, they succeeded in spite of their clothes rather than by reason of them. They might have been twice as great had they created a first good impression by wearing good clothes. There would have been no repulsive or unattractive personal features to combat their efforts.

It has been said that a people can be judged by its architecture. We hope this rule will not be applied to the distribution, service and housing end of the motor car industry. The prestige of the industry certainly would not gain by the application.

No Thought to Garages

A search through the exhibit of the Chicago Architectural Club's exhibit, now at the Chicago Art Institute, revealed not a single specimen of Garage Architecture! This fact, in itself, shows that architects are not even thinking of garages. They would be thinking and executing their thoughts if they were being paid to do so? There are scores of residences, school buildings, theaters, office buildings, etc., at the exhibit, but not one garage! Yet, who will deny the statement that the garage builder should have more money to spend for architectural services than the home builder?

When we get right down to the actual investment we find that aside from paying a small amount for architectural brains there is no great increase in cost unless we wish. It is more a question of taking the materials at hand and working them into a pleasing mass than of selecting special or expensive materials.

Sixty Per Cent of Recent Sales Made Through a New Plan of

FREE SERVICE REPORT

WITHIN the last few months William T. Taylor, Philadelphia, eastern distributor of Apperson cars, has perfected a service system which has worked out in an eminently satisfactory way in linking up the customer and the salesman.

This is a story about service, not sales, yet service of the right kind makes sales and promotes that extremely valuable asset, good will; and sales, service and the customer are so connected through William T. Taylor's new system that it is stated as an undeniable fact that sixty per cent of the firm's sales have been made through the new service plan since its introduction less than half a year ago.

The main factor in the new system is a free service report. In this system the salesmen advertise, through their efforts, the service rendered on Apperson cars, as much as they push cars. They never make a sale that they do not push the service end to the prospect and they have learned that this helps close sales.

The free service report form is a white sheet of standard letter size, and roughly, its use may be seen in the following procedure:

Each month every Apperson purchaser, whether of a new, or a used car, receives notice to present his car at the service station for free inspection. A painstaking examination of the car by a head tester selected for this type of work; and after this examination has been completed, entries are made, on the free service report form, of the adjustments and repairs. This is submitted to the customer, enumerating discrepancies and making suggestions for any improvements in the operation of the car, as well as suggestions on low maintenance cost. These entries are made in pencil.

Each salesman of William T. Taylor carries his Free Service Report blanks as religiously as he carries his contract forms and while he pushes service in this way constantly, he leaves the technical discussions pertaining to that department to that division's experts.

Just free service under other conditions may not accomplish very much, but the combination of high-grade cars sold by high-grade salesmen and backed by free, high-grade service always is a winner, according to the standpoint of William T, Taylor, and his organization

But the report, before reaching the car owner's hands, passes under the inspection of the general manager, Bevan P. Y. Jordan, who has copies of the original penciled suggestions made on similar forms, in neatly typed triplicate. After being copied, the original penciled form is destroyed, the duplicate being retained in the office of the general manager, where it is filed as an official record, for the purpose of keeping the head of the organization and the salesman who sold the car conversant and in closer touch with the owner. The triplicate is sent to the customer. The advantage accrues to the owner, of knowing, at any time, the exact condition of his car.

When he wishes to sell it, these monthly reports he has been receiving form a complete mechanical chronology covering the period of his ownership of the car. This will be appreciated by his own prospective customer and establishes indisputable evidence of the car's exact mechanical condition.

The reports also keep the firm informed as to the car's condition and should the owner desire to trade it in, in another purchasing transaction with the firm, the latter has an accurate check on what has been done to it and its value for appraisal. Thus it will be seen that the transaction is kept between the main office, or sales department, and the owner.

Using the Free Service Report

The first use of the report, generally is under the usual ninety-day guarantee for free service. Car No. 19645, standard model, purchased in 1919 may have some such discrepancy as poor carbureter adjustment and tight service brakes. There would, of course, be no charge.

The adjustments mentioned would have been made at the time of inspection, as such discrepancies would be in the nature of short jobs.

A second use, or manner of making entry in the report would be, say, where a broken fender would show the damage to be due to the fault of the owner. The condition of the car usually tells an expert whether the damage is the owner's fault. If the firm is responsible for an accident, or damage, the owner of the car is not charged for its repair, within the ninety-day guarantee, or outside of it.

A third use of the report might be as follows: A 1917 model, after the ninety-day guarantee period has expired, shows carbon in the engine and need of valves adjustment. The approximate cost of adjustment and repair might be $1.75, taking a merely hypothetical case, where a general overhaul revealed the foregoing conditions.

WILLIAM T. TAYLOR
EASTERN DISTRIBUTOR
APPERSON MOTOR CARS

BEVAN P. Y. JORDAN, GENERAL MANAGER — O. W. HOFFMAN, MANAGER OF SERVICE

FREE SERVICE REPORT

This Service is indispensable for the perfect running of your car. It is executed at a great expense to the company, but a tremendous saving to the customer. Its success depends upon the co-operation of the owner, and the religious observance of the recommendations herein contained cannot help but give low-cost maintenance and satisfied ownership. A complete chronology of this report is on file at this office for record.

"Don't let a month slip by without an inspection."

Car No. 35471 Model 40 Year 1917

Mr. Edward Hetherington.

The following discrepancies have been found in your car:

Carbon in motor.

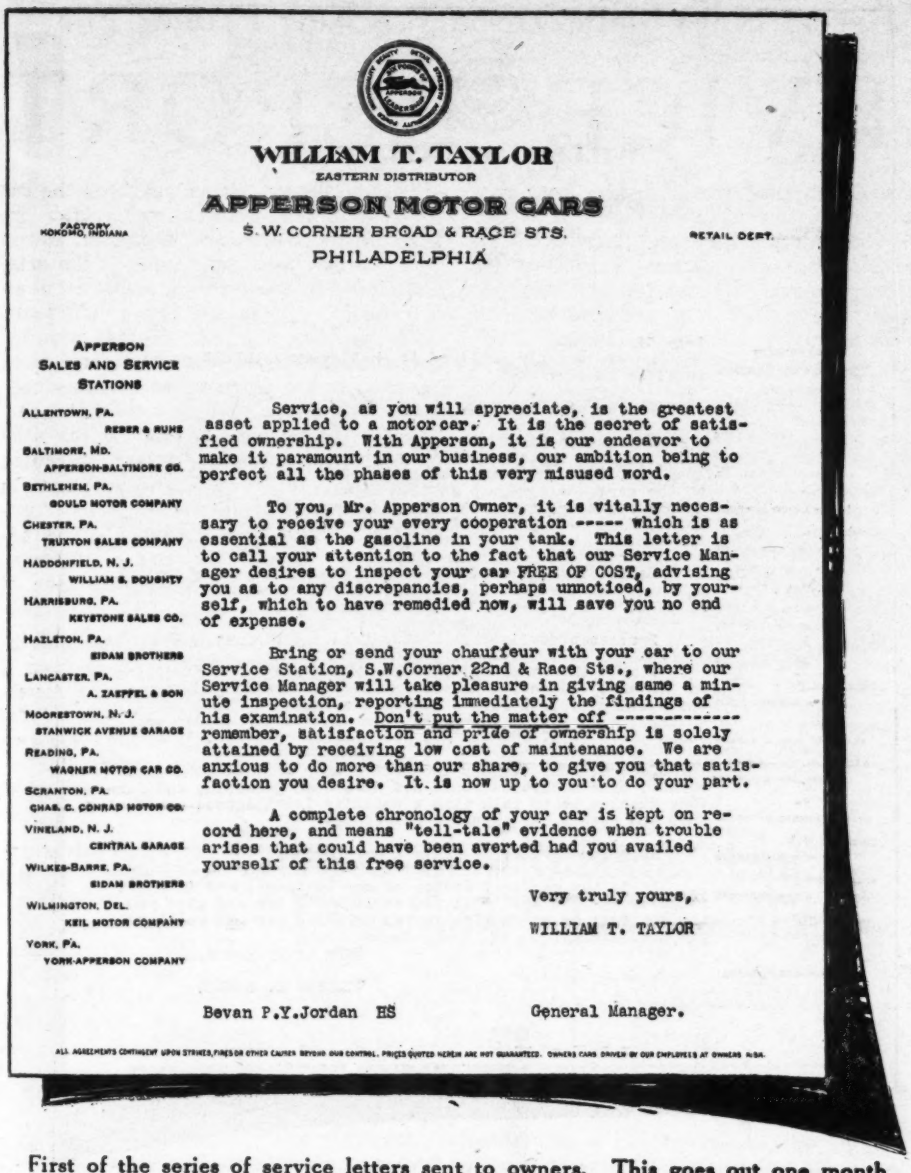
Valves in need of adjustment.

Approximate cost to adjust above $ 1.75

Appointment for bringing car to Service Station March 15, 1920.

ALL AGREEMENTS CONTINGENT UPON STRIKES, FIRES OR OTHER CAUSES BEYOND OUR CONTROL. PRICES QUOTED HEREIN ARE NOT GUARANTEED. OWNER'S CARS DRIVEN BY OUR EMPLOYEES AT OWNER'S RISK

This is a reproduction of the free service report after the expiration of the ninety-day guarantee period



WILLIAM T. TAYLOR
EASTERN DISTRIBUTOR
APPERSON MOTOR CARS
FACTORY KOKOMO, INDIANA
S.W. CORNER BROAD & RACE STS. RETAIL DEPT.
PHILADELPHIA

APPERSON SALES AND SERVICE STATIONS

ALLENTOWN, PA. REBER & RUHE
BALTIMORE, MD. APPERSON-BALTIMORE CO.
BETHLEHEM, PA. GOULD MOTOR COMPANY
CHESTER, PA. TRUXTON SALES COMPANY
HADDONFIELD, N. J. WILLIAM S. DOUGHTY
HARRISBURG, PA. KEYSTONE SALES CO.
HAZLETON, PA. SIDAM BROTHERS
LANCASTER, PA. A. ZAEPFEL & SON
MOORESTOWN, N. J. STANWICK AVENUE GARAGE
READING, PA. WAGNER MOTOR CAR CO.
SCRANTON, PA. CHAS. C. CONRAD MOTOR CO.
VINELAND, N. J. CENTRAL GARAGE
WILKES-BARRE, PA. SIDAM BROTHERS
WILMINGTON, DEL. KEIL MOTOR COMPANY
YORK, PA. YORK-APPERSON COMPANY

Service, as you will appreciate, is the greatest asset applied to a motor car. It is the secret of satisfied ownership. With Apperson, it is our endeavor to make it paramount in our business, our ambition being to perfect all the phases of this very misused word.

To you, Mr. Apperson Owner, it is vitally necessary to receive your every cooperation ----- which is as essential as the gasoline in your tank. This letter is to call your attention to the fact that our Service Manager desires to inspect your car FREE OF COST, advising you as to any discrepancies, perhaps unnoticed, by yourself, which to have remedied now, will save you no end of expense.

Bring or send your chauffeur with your car to our Service Station, S.W.Corner 22nd & Race Sts., where our Service Manager will take pleasure in giving same a minute inspection, reporting immediately the findings of his examination. Don't put the matter off ---------- remember, satisfaction and pride of ownership is solely attained by receiving low cost of maintenance. We are anxious to do more than our share, to give you that satisfaction you desire. It is now up to you to do your part.

A complete chronology of your car is kept on record here, and means "tell-tale" evidence when trouble arises that could have been averted had you availed yourself of this free service.

Very truly yours,

WILLIAM T. TAYLOR

Bevan P.Y.Jordan HS General Manager.

ALL AGREEMENTS CONTINGENT UPON STRIKES, FIRES OR OTHER CAUSES BEYOND OUR CONTROL. PRICES QUOTED HEREIN ARE NOT GUARANTEED. OWNERS CARS DRIVEN BY OUR EMPLOYEES AT OWNERS RISK.

First of the series of service letters sent to owners. This goes out one month after the purchase of the car

In connection with the free service idea, there are twelve service letters in a follow-up system. All these letters are mimeographed, care being taken to have an especially good job done so that they closely resemble well-typed individual letters, names and addresses being typed in, from the mailing list.

Letters Signed by Manager

The first letter in the series, reproduced herewith, is sent out over William T. Taylor's mimeographed typed signature, actually signed in ink by the general manager. The owner receives this just one month after he has purchased his car. Files of these letters are kept in the office of the general manager and the triplicate is sent to the service manager, so that he may have knowledge regarding the customer's calls.

If the customer does not appear promptly, or send his chauffeur, then a second form letter is sent out. Should this second letter fail to bring a response from the customer, the salesman who sold the customer his car calls him up on the telephone and suggests that he bring in his car as soon as possible. This links the salesman and his customer in the closest possible way and shows that the interest of the salesman in the customer does not cease abruptly when the sale has been made.

There are various ways in which the service end of the business is advertised. They are as follows:

1—Through the newspapers.

2—Through the salesman's talking service and showing his ever-ready free service report to the prospect.

3—Through a special sales letter, explaining and accentuating the service, issued by the general manager.

4—Through the monthly service letters after the prospect has become an owner.

5—Through the activities and good work of the service department itself.

As to newspaper advertising, especially satisfactory results have been obtained through reproducing in a series of displays, each about 11½ by 4½ in., copies of the free service report, filled out as actually in work, with an explanation in outline below.

Somewhat of a novelty in automotive publicity is the publishing, in each advertisement of the series, at the bottom of the display, the name of a salesman, after this method:

"Mr. John L. Brown will gladly explain and demonstrate the many superior points of the Apperson. Ask or 'phone him."

This being in bold-face type, gives the prospect an opportunity to ask for some one definitely to explain and demonstrate when he calls and he feels sure he will be given attention. It also gives each salesman, in rotation, a chance at a sale.

The method gives personal touch to the advertisement and is one more way of linking up the salesman and the customer.

Thus it may be seen that the salesman's work in the interest of the customer helps the service end of the business. The customer is educated by the salesman from the start to bring his car always to this particular shop for repairs and adjustments, insuring to the customer the right kind of service and at the same time bringing all the Apperson cars possible, in the aggregate, to the place. This, of course, greatly increases the shop work and the large amount of labor done monthly on the cars eliminates idleness of the shop force.

Different Grades of Service

In service work, after the expiration of the ninety-day guarantee, there are two angles to be considered:

(a) Cases where the customer wants his car to be maintained at "concert pitch" regardless of expense.

(b) Cases where it is advisable, because of the limits of the customer's pocketbook, to keep his car in the best possible condition with due regard, in the matter of replacements, especially, and adjustments, to economy while consistent with the highest workmanship.

While the foregoing angles are fully self-explanatory to the trade, they are mentioned simply to show that discrimination is the best policy in such cases; that is, in the second event it would not be just to go ahead and put in costly new parts where slight repairs would serve the purpose.

In this system, track is kept of every Apperson car sold, even after it has been resold to the successors of the original owner, a complete mechanical maintenance record of each being on file. To the standard white Prospect Card, 6 by 4 in., used in the sales department, after the prospect has become a customer, is clipped a plain white card of the same size, bearing the following data: Customer's name, address, both office and residence, with telephone numbers; model of car; car number; whether new or used and the date of the transaction. In other words, after the prospect has become a customer, the re-

quired data from the prospect card are transferred to the white card and both are preserved together, and filed alphabetically.

As fast as a follow-up letter of the series already described, is sent out, it is so noted, by date, on the reverse of the white Customer's Card, so that at any time the office knows exactly what letters, and how many, have been sent out and there is no chance of sending the same letter twice, in the same month to the same owner.

This system is carried through each succeeding ownership of that particular car. In keeping this record the car is always put through as if sold when new and thus carried to the end of the transaction, the data on the original card, of course, showing when the car was new. Thus the record is kept as of the car, not as of the owner.

The Necessity of Proper Maintenance

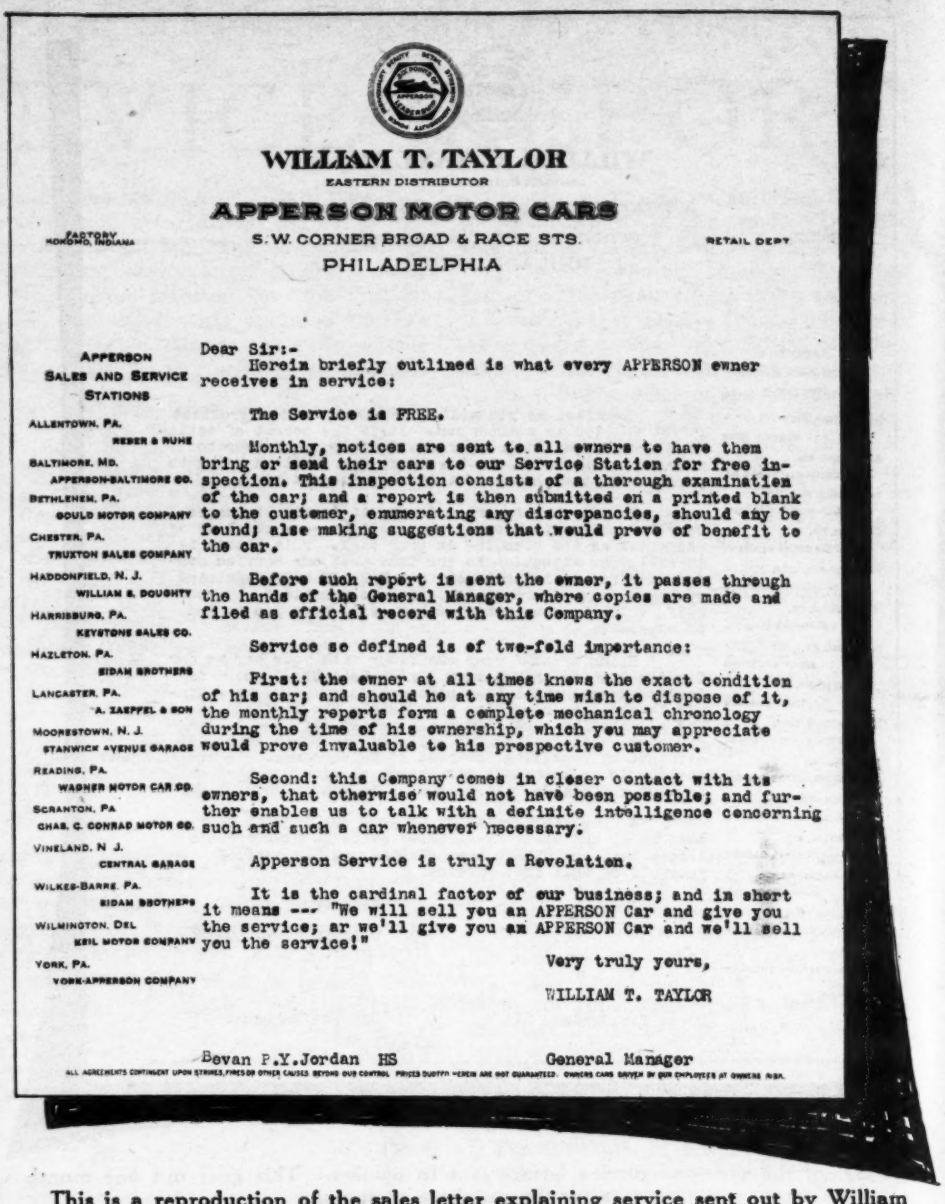
WHAT is the value of efficient designing if the utmost efforts of genius are expended in developing and producing a highly efficient car, if that same car is allowed to run direct from the factory to the junk pile? Or, even worse, if it is accelerated on its way by incompetent repair work?

Millions of dollars are spent annually to obtain efficiency in design and production for this one purpose alone, that operation cost may be reduced to the minimum. And probably as many millions of dollars are misspent annually on incompetent repair work which tends to reduce the same efficiency on which so much effort and genius has been expended. A minor adjustment, poorly executed, may destroy months of effort of the best designer.

It will never be possible to fully supervise the operation of the automobile, but it is possible to increase this supervision enormously. This can only be done by instilling in the mind of the car owner confidence in the repair shop. To gain this confidence the repair shop must prove its worth by turning out fully as high-grade work as does the factory. The man who directs this work must, not only be familiar with the underlying principles of design, construction and operation, but must be able to put into practice what he knows, he must also be familiar with the peculiarities of all cars and, furthermore, he must be able to impress upon the mind of the car owner that he is competent to take care of every detail of repair that might arise.

In 1911 there were in this country 667,000 automobiles and trucks, in 1912 this number had increased 60 per cent to 1,068,000, in 1917 this had increased 640 per cent to 4,941,000 and at the present time there are over 6,500,000 cars in use, an increase of 1000 per cent since 1911.

It has been estimated that each car uses 500 gallons of gasoline per year; with 6,500,000 cars in use the annual gasoline consumption is now 3,250,000,000 gallons. Through faulty ignition and improper carbureter adjustment 10 per cent of this amount is wasted, which means an annual waste of 325,000,000 gallons, or over $80,000,000.



WILLIAM T. TAYLOR
EASTERN DISTRIBUTOR
APPERSON MOTOR CARS
FACTORY KOKOMO, INDIANA
S.W. CORNER BROAD & RACE STS.
RETAIL DEPT
PHILADELPHIA

APPERSON SALES AND SERVICE STATIONS
ALLENTOWN, PA. REBER & RUHE
BALTIMORE, MD. APPERSON-BALTIMORE CO.
BETHLEHEM, PA. GOULD MOTOR COMPANY
CHESTER, PA. TRUXTON SALES COMPANY
HADDONFIELD, N. J. WILLIAM S. DOUGHTY
HARRISBURG, PA. KEYSTONE SALES CO.
HAZLETON, PA. SIDAM BROTHERS
LANCASTER, PA. A. ZAEPFEL & SON
MOORESTOWN, N. J. STANWICK AVENUE GARAGE
READING, PA. WAGNER MOTOR CAR CO.
SCRANTON, PA CHAS. C. CONRAD MOTOR CO.
VINELAND, N. J. CENTRAL GARAGE
WILKES-BARRE, PA. SIDAM BROTHERS
WILMINGTON, DEL KEIL MOTOR COMPANY
YORK, PA. YORK-APPERSON COMPANY

Dear Sir:-

Herein briefly outlined is what every APPERSON owner receives in service:

The Service is FREE.

Monthly, notices are sent to all owners to have them bring or send their cars to our Service Station for free inspection. This inspection consists of a thorough examination of the car; and a report is then submitted on a printed blank to the customer, enumerating any discrepancies, should any be found; also making suggestions that would prove of benefit to the car.

Before such report is sent the owner, it passes through the hands of the General Manager, where copies are made and filed as official record with this Company.

Service so defined is of two-fold importance:

First: the owner at all times knows the exact condition of his car; and should he at any time wish to dispose of it, the monthly reports form a complete mechanical chronology during the time of his ownership, which you may appreciate would prove invaluable to his prospective customer.

Second: this Company comes in closer contact with its owners, that otherwise would not have been possible; and further enables us to talk with a definite intelligence concerning such and such a car whenever necessary.

Apperson Service is truly a Revelation.

It is the cardinal factor of our business; and in short it means --- "We will sell you an APPERSON Car and give you the service; ar we'll give you an APPERSON Car and we'll sell you the service!"

Very truly yours,

WILLIAM T. TAYLOR

Bevan P.Y.Jordan HS General Manager

ALL AGREEMENTS CONTINGENT UPON STRIKES, FIRES OR OTHER CAUSES BEYOND OUR CONTROL. PRICES QUOTED HEREIN ARE NOT GUARANTEED. OWNERS CARE GIVEN BY OUR EMPLOYEES AT OWNERS RISK.

This is a reproduction of the sales letter explaining service sent out by William T. Taylor to the prospect

Preventable waste in the operation of a car comes from several sources which are enumerated in their relative importance as follows: Poor carburetion, faulty ignition, poor compression, loose bearings and other preventable friction losses. By proper supervision waste, due to these causes could be reduced to an enormous extent.

Proper carbureter adjustment should receive careful consideration. By proper carbureter adjustment is not meant that adjustment by which an engine will fire under every condition, but it is that one by which the highest efficiency may be obtained. The tendency is now toward a too rich mixture, and it might even be said that this is universal practice. Influenced by the popular demand for easy starting and for an adjustment that will allow operation without giving attention to dash controls, the poorly informed repair man will, by repeated trials, finally arrive at an adjustment that will satisfy his customers' demands. The adjustment that is obtained in this way is very near to the rich limit rather than where it should be to the lean one. This adjustment, which is the prevailing one, not only directly increases gasoline consumption, but also produces an excess of carbon deposit which reduces the capacity of the compression chamber, fouls spark plugs, scores piston rings and cylinder walls, and pollutes the lubricating oil, each of which aggravates the other.

Carbureter and ignition repairs are usually inexpensive and require but little time, consequently, the repair man has little trouble in inducing the car owner to have this work done; in fact, the owner seems to like to believe that all of his troubles lies in these two places.

There is no better place to study the numerous ills, incident to motor car operation than the repair shop. With the repair engineer co-operating with the designer and the production engineer many improvements might be made.

Carload of Cletracs delivered recently by G. M. Huebsch, Pomona

Orange Groves of Pomona, Cal., Determine Tractor Types

Three Automotive Concerns and One Exclusive Dealer Control Tractor Business

BY FRED M. LOOMIS

POMONA, Calif., May 1—"Did you ever see anything there wasn't some grief attached to?" asked an automotive dealer the other day at Pomona, but he asked it with a smile which said just as plainly as anything could say: "Poof! What of it? Let 'er come! I'll take my medicine like a man and fight it out right here."

And that's the attitude of the automotive dealers, because that's what they are. There are four of them at present. There's Fred Reynolds, the Ford dealer, who, with sixty or seventy tractors out in the vicinity of Pomona shares with Hinman & Son the best sales record of anyone; then there's G. M. Huebsch, the Chevrolet dealer, who has put out about thirty Cletracs. These two are the real automobile-tractor dealers. Then the paint was just drying on the walls of the newly established branch of the Samson Tractor Co. of California, which will sell the entire Samson automotive line to the orange growers around Pomona. And lastly, there's Hinman & Son. It's true, of course, that for the past eighteen years Hinman & Son have sold feed and fuel, and still sell them. But, in addition now, the concern sells the Fageol tractors and motor trucks and all implements which go with the tractor. In a nearby village the International Harvester Co. line of tractors is sold quite extensively by an implement dealer, but he cannot legitimately be numbered with the Pomona dealers.

Thus in this place three automotive concerns and one exclusive dealer control the tractor business. That sounds almost like any typical town of the middle west.

Pomona was the Grecian Goddess of Fruit, and maybe it was this association which induced the building of the Greek theatre in the public park of Pomona, in which such high-brow actors as Forbes Robertson occasionally used to give one of Sophocles' or Euripedes' plays. But,

Opera garage, Pomona. Lee R. Matthews sells the Cadillac here

TRACTORS IN THE ORANGE GROWING COUNTRY

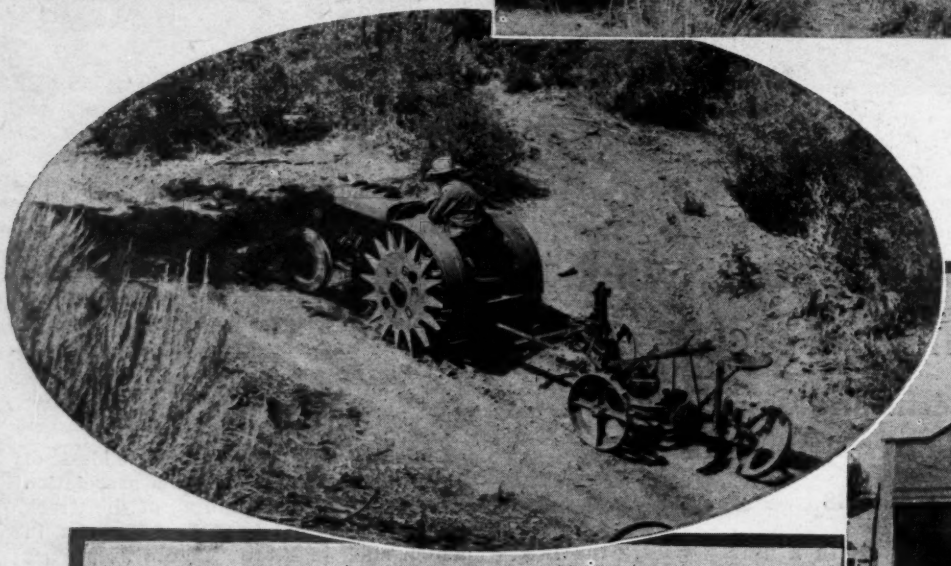
however that may be, the hustling little town is appropriately named. It is almost entirely surrounded by dense orange groves, the air is heavy with the scent of orange blossoms and from it go every year thousands of cars of citrus fruits. It surely is the very altar of Pomona, the Goddess of Fruit.

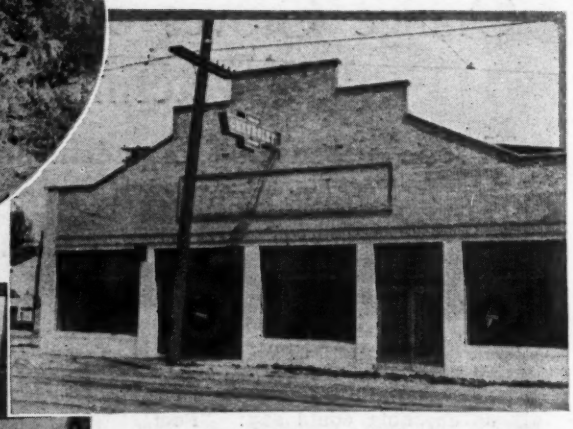
But this very fact makes the difficulties of tractor dealers greater and determines absolutely the type of tractor which must be sold in the vicinity and makes the service on those tractors the most important function of the dealer. Thus one finds that every dealer is thoroughly equipped to render service, gives it promptly and efficiently, and, what is by no means always the case out here, usually charges for it. In fact, the tractor business in Pomona is based primarily upon service.

Of course, one expects the Ford dealer to be equipped for service. This is almost the universal rule, and Fred Reynolds here is no exception. He has everything he ought to have in the way of a shop, equipment, mechanics, service trucks and service cars and the percentage of dissatisfaction in consequence among Fordson owners in this vicinity is surprisingly small. Even Reynolds' competitors admit that the Fordson is doing good work.

Above—How Hinman & Son deliver Fageol tractors

Left—Fageol tractor on its way to work





Where G. M. Huebsch sells Chevrolet cars and Cletrac tractors

Above—Cletrac working in orange grove near Pomona. Left—Flower bordered path on typical Southern California place. Tractor must work under the trees

Huebsch, the Cletrac dealer, has his Chevrolet service station with its equipment to rely upon, and also at the present time has attached to his staff a service man from the Los Angeles Cletrac agency who is calling on every Cletrac owner in the Pomona territory and seeing that he stays satisfied.

The situation is somewhat different with Hinman & Son. When they took on the Fageol line something like a year ago they were not very well equipped for service. As stated before the concern has been in the feed, fertilizer and fuel business for nearly a score of years. Some two years ago when natural gas was piped into Pomona from the Los Angeles oil districts, Hinman thought he saw the probability of a big part of his

E. Hinman & Son specialize on Fageol tractors and motor trucks

Sales and service station from which Fred Reynolds at Pomona has sent scores of Fordson tractors into nearby orange groves

business slipping away from him. In order to maintain his volume of trade and also his organization he began looking around for something to take the place of the fuel he had been selling. It appears that the younger Hinman had had a satisfactory experience with a Fageol tractor, which he had bought to use in his own orange grove. Recognizing the possibility of selling this tractor in the vicinity he concluded to take on the agency.

The results were satisfactory almost from the outset. Within the year he has sold sixty-seven Fageol tractors and could have doubled that number had he been able to procure them. Just as a matter of incidental interest he recently sold one to a tourist, who ordered the machine shipped to Belle Plaine, Iowa, for use in an Iowa apple orchard.

Equipped for Service

Having learned by means of his own experience that service on tractors is an essential part of a dealer's duty, Hinman no sooner secured the agency for the Fageol than he began to prepare himself to give service. This he did by renting a garage, completely equipped for repair work, by hiring two competent mechanics and by putting in an adequate stock of spares. The quarters rented already are proving inadequate and Hinman consequently is building a service station 65 by 130 ft., which will have for its primary object service on Fageol tractors and motor trucks. In addition he will do general automotive repair work in order to help out on the overhead maintenance of his shop. Hinman anticipates, however, that his equipment will be able to maintain itself almost entirely from the service rendered on Fageol automotive equipment. Furthermore, he says, this shop must pay its own way. If it does not show a profit, and if the men who run it fall down on the proposition, he intends to hire men who can make good. The service station will be run as a department entirely distinct from the regular business.

Hinman's attitude toward service is more modern than that of a majority of the tractor dealers in this section. The Fageol is sold on a three months' guarantee against defective breakage, but after that the owner pays $1 an hour for all service given in addition to the cost of parts and materials used.

Hinman is just now preparing for a scheme which will prove a novelty in these parts. He has purchased a couple of trailers and will maintain constantly two service tractors which will be loaded on the trailers. When a service call comes in one of these trailers, loaded with the tractor, responds at once. If some little time must be consumed in servicing the owner's tractor, the Fageol on the trailer is unloaded and put to work in place of the disabled machine. The job of servicing completed the loaned Fageol is reloaded on the trailer and accompanies the service man back to the shop. As the Fageol is perhaps the smallest of all the tractors in use in this section this sort of service will be easy. A charge of $1 an hour for the rent of the loaned tractor will be made.

Books Show He Is Making Money

Hinman estimates that during his first year the service he gave on tractors cost him an average of $17 per machine. With increasing knowledge of how to operate and maintain the tractor on the part of tractor owners, coupled with a better knowledge on his own part of grousers and other necessities to meet orchard conditions, he estimates he will be able to cut this charge to something like $10 in the future. He does not know just what his selling overhead is, but says he can make an average commission of 22½ per cent, and that his books show that he is making money.

As was said before the tractor trade around Pomona is almost exclusively for orchard work. The orange tree is not large. Only in some of the earlier and older orchards are the trees permitted to grow more than from ten to fourteen feet in height. Neither is there a wide spread to the branches. The tree grows close and dense and is very symmetrical in shape. The spacing usually is about twenty by twenty-two feet, and rarely do the branches of one tree touch its neighbor. The branches do, however, grow close to the ground, and when in fruit the periphery of the tree touches the ground all around. As cultivation ordinarily is clear to the trunk it must be evident that only a low and small tractor, and one with a short turning radius, can negotiate an orange grove satisfactorily.

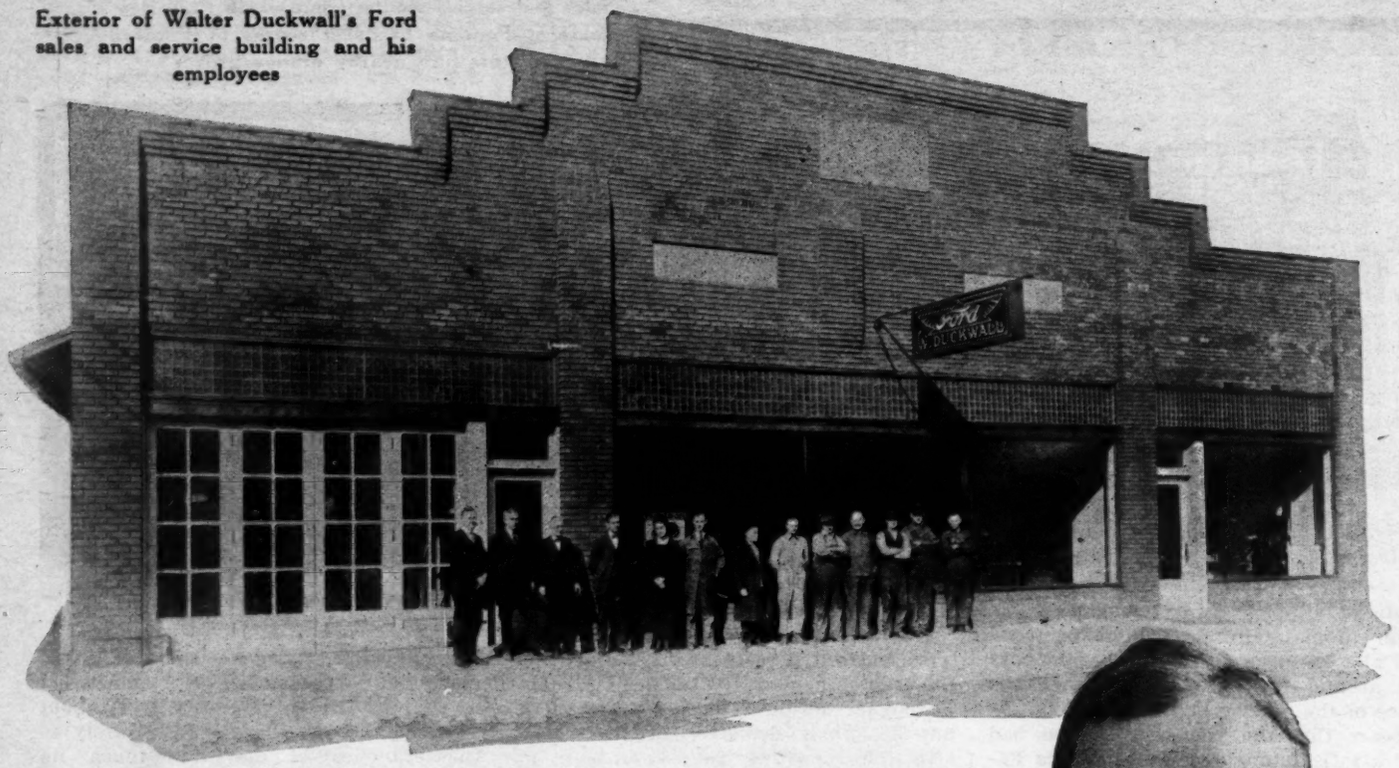
Fenders Necessary Equipment

This means that small tractors like the Fageol, the Cletrac, the Fordson and the International are peculiarly adapted for this work, especially when they are equipped with certain necessary accessories. These consist principally of protective shields or fenders which permit the tractors to run close to the trees without damaging branches or fruit. The latter is very important since the orange tree is constantly bearing, blossoms, immature fruit and ripe oranges appearing on the same tree at the same time.

The cultivating tools also are commonly protected, especially disc harrows. A fender is put over the outer ends of the gangs which permit the harrow to slide under the branches of the trees, so that the rolling blades do not cut the branches or fruit when cultivating close up to the trunk. A similarly protected gang plow, which also is leverless, is being tried out now by one of the Los Angeles tractor companies.

The close spacing of the trees makes a short turning radius necessary, and the character of the soil necessitates special grousers. Take the Fordson as an example of the small wheel tractor. The standard grouser equipment is replaced by grousers which are six inches in depth. Holes are bored in the standard lug which comes from the factory and these wider grousers are bolted onto

(*Continued on page 20*)



Exterior of Walter Duckwall's Ford sales and service building and his employees

SERVICE FROM A GOLDEN PLATTER

Walter Duckwall, Ford Dealer at Noblesville, Ind., Equipped for the Best Kind of Service and Has Not a Dissatisfied Customer

SELLING service is more important for the dealer than selling new cars. Out of the service sold rightly and performed according to the promises under which it was sold, comes a cycle of sales which makes for permanence.

That is the business fundamental of Walter Duckwall, Ford agent of Hamilton county, Indiana, with headquarters at Noblesville and with a branch at Sheridan.

Mr. Duckwall defines service as the duty of the dealer to keep the motor car running best at the lowest possible cost to the owner and with uninterrupted work, or as nearly approaching that as possible.

Mr. Duckwall has fitted up two ideal service stations, one at Noblesville and one at Sheridan, where service, as nearly perfect as he is able to give is rendered. Where Ford products may be given intelligent, prompt service.

In Hamilton county, there are 3000 Ford owners, who will testify to the quality of Duckwall service. Indeed, questioning many of these Ford owners, they swear by Duckwall and the Ford car and, questioning them more intensively, it seems that they are satisfied because Duckwall has seen to it that they have had real joy and happiness out of their cars, and that which was promised by the salesman was carried out, in the service which Duckwall offered and in the durability and the economy of the car itself.

Mr. Duckwall has now evolved a plan —perhaps an incomplete plan—of selling his service to the Ford owners of Hamilton county.

"It may be that Ford owners are having their work done at places where the workmanship is not of the best. That is bad," said Duckwall. "It may be that

Walter Duckwall

Note orderly arrangement of parts department of Walter Duckwall's business

the parts used in the repairs are not genuine, that is, they do not have the stamp of the Ford Motor Co., and that is worse.

"It may be that ostensibly the owner thinks he is saving money by having that work done elsewhere. That is indeed questionable." In fact, Duckwall believes that he can take care with his two branches of nearly all the Ford service in his territory and do it best, at the lowest cost to the consumer.

"Certainly, we have all been too lame on service," said Duckwall. "Service in motor cars is the big thing about the business and now with the business shaping itself into maturity, selling service as part of business salesmanship must be developed with the same degree with which we have developed the sale of the motor cars.

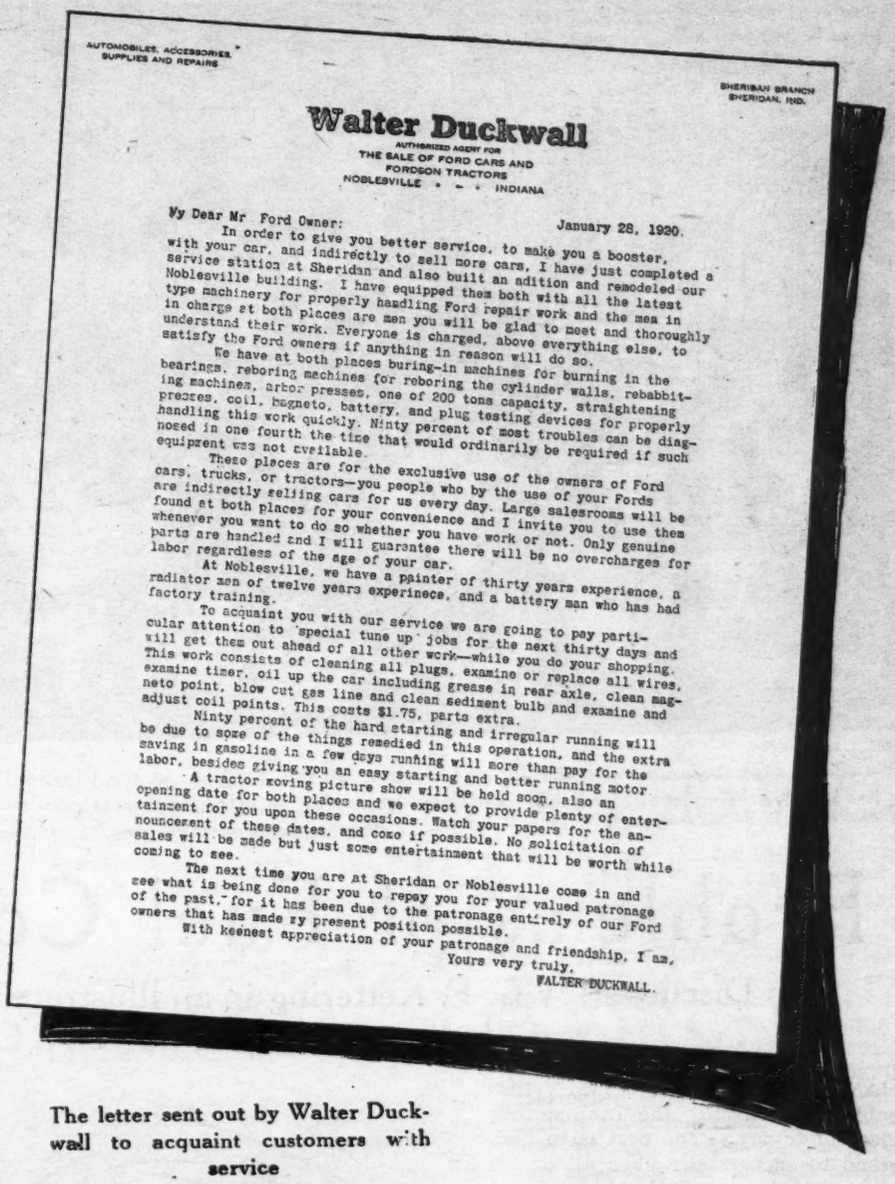
Service Must Be Worthy

"Before selling service, we must have something to sell. What is it worth to attempt to sell service, if after all, you are not equipped to handle it rightly, if the customer is coming back with a kick, and if the equipment is not of the latest and the best, where every operation is a time-saving operation?"

Duckwall spent a lot of money on equipping his service stations at Noblesville and Sheridan with the best of equipment, with a full supply of parts and a well regulated supply. His places have been pointed out to other Ford agents as something which might be imitated.

He believes in advertising service; that is, in selling it to his community. He not only uses the daily papers in Noblesville, but uses the weekly papers in all the towns of the county to tell Ford owners of the excellent service established and which is carried.

He writes his own copy for these advertisements and uses it with copy supplied by the Ford Motor Co. Knowing the peculiar mental attitude of his owners ensemble, Duckwall is able to prepare some mighty effective copy. It has been proved to pull.



AUTOMOBILES, ACCESSORIES, SUPPLIES AND REPAIRS

SHERIDAN BRANCH
SHERIDAN, IND.

Walter Duckwall

AUTHORIZED AGENT FOR
THE SALE OF FORD CARS AND
FORDSON TRACTORS
NOBLESVILLE + - + INDIANA

My Dear Mr Ford Owner: January 28, 1920.

In order to give you better service, to make you a booster, with your car, and indirectly to sell more cars, I have just completed a service station at Sheridan and also built an adition and remodeled our Noblesville building. I have equipped them both with all the latest type machinery for properly handling Ford repair work and the men in in charge at both places are men you will be glad to meet and thoroughly understand their work. Everyone is charged, above everything else, to satisfy the Ford owners if anything in reason will do so.

We have at both places buring-in machines for burning in the bearings, reboring machines for reboring the cylinder walls, rebabbiting machines, arbor presses, one of 200 tons capacity, straightening presses, coil, magneto, battery, and plug testing devices for properly handling this work quickly. Ninty percent of most troubles can be diagnosed in one fourth the time that would ordinarily be required if such equipment was not available.

These places are for the exclusive use of the owners of Ford cars, trucks, or tractors—you people who by the use of your Fords are indirectly selling cars for us every day. Large salesrooms will be found at both places for your convenience and I invite you to use them whenever you want to do so whether you have work or not. Only genuine parts are handled and I will guarantee there will be no overcharges for labor regardless of the age of your car.

At Noblesville, we have a painter of thirty years experience, a radiator man of twelve years experience, and a battery man who has had factory training.

To acquaint you with our service we are going to pay particular attention to 'special tune up' jobs for the next thirty days and will get them out ahead of all other work—while you do your shopping. This work consists of cleaning all plugs, examine or replace all wires, examine timer, oil up the car including grease in rear axle, clean magneto point, blow out gas line and clean sediment bulb and examine and adjust coil points. This costs $1.75, parts extra.

Ninty percent of the hard starting and irregular running will be due to some of the things remedied in this operation, and the extra saving in gasoline in a few days running will more than pay for the labor, besides giving you an easy starting and better running motor.

A tractor moving picture show will be held soon, also an opening date for both places and we expect to provide plenty of entertainment for you upon these occasions. Watch your papers for the announcement of these dates, and come if possible. No solicitation of sales will be made but just some entertainment that will be worth while coming to see.

The next time you are at Sheridan or Noblesville come in and see what is being done for you to repay you for your valued patronage of the past, for it has been due to the patronage entirely of our Ford owners that has made my present position possible.

With keenest appreciation of your patronage and friendship, I am,

Yours very truly,

WALTER DUCKWALL.

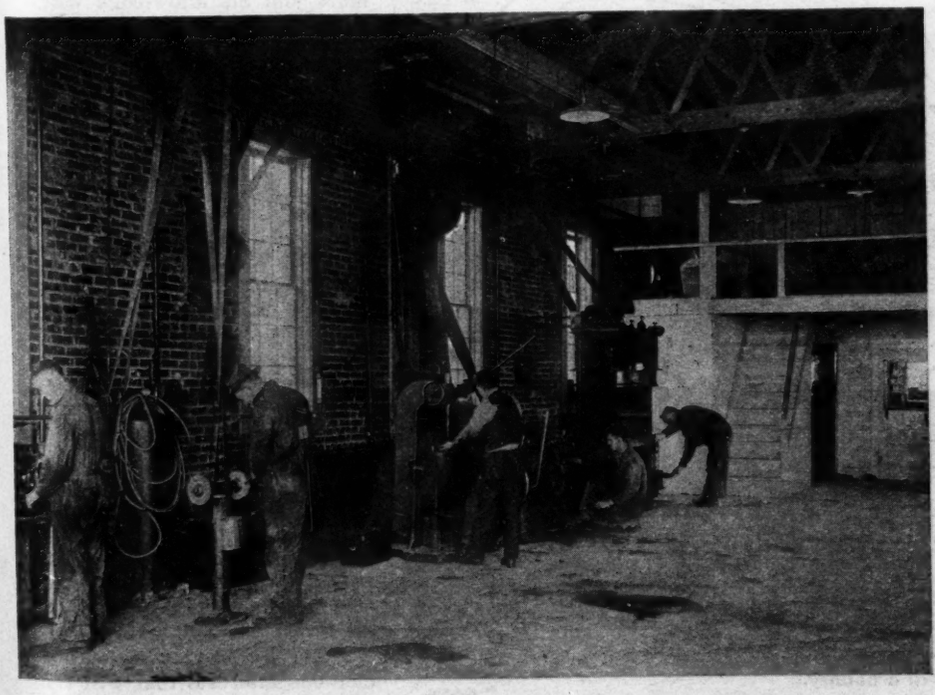
The letter sent out by Walter Duckwall to acquaint customers with service

He believes in direct-by-mail letters to the 3000 Ford owners in his county and sends to these at frequent intervals good strong sales letters, multigraphed and without his personal signature in script.

That personal signature is not necessary for him, he says. Duckwall, for instance, with the recent completion of his new service stations sent them all a letter announcing the fact, saying that he had equipped both places with the machinery for properly handling Ford repair work.

Emphasis was made on the machines for burning in the bearings, machines for reboring the cylinders, re-babbitting machines, arbor presses, straightening presses and devices for testing coil, magneto, battery and plug.

At Sheridan, there is a 200-ton tire press, where service is given to many trucks which haul to a creamery there.



A corner in the shop of the Sheridan, Ind., branch of Walter Duckwall, Ford dealer of Noblesville, Ind.

The annual banquet of the Indiana Section of the S. A. E. at the Claypool Hotel, Indianapolis, Ind., at which Mr. Kettering spoke was a record breaker so far as attendance was concerned, there being five hundred and twenty-seven persons present

Problems of Fuel Combustion

As Discussed by C. F. Kettering in an Illustrated Lecture Before the Indiana Section of the S. A. E.

INDIANAPOLIS, May 1—"Two vital problems confront the automotive engineer of to-day: The first is to find a method to successfully burn all or as much as seems practical of the crude petroleum produced, and the second, which will be brought about through the exhaustion of our petroleum supply, will be to produce a new fuel." Other important considerations which were driven home by C. F. Kettering, president, Dayton Electric Laboratories, at the last meeting of the season of the Indiana section of the S. A. E. here last night were that:

"To make our fuel supply adequate for the next twenty years, we must either decrease car production, increase fuel supply, or increase the efficiency of the present engine . . . Our refining capacity today is adequate to handle two times our present fuel production. . . . There are only 1.75 gallons of fuel produced per day for every vehicle in operation. . . . The fuel problems can only be expected to be fully solved by co-operation of all industries concerned. The engine maker must work in correlation with the fuel producer. The fuel producer must co-operate with the chemist. The chemist must join his knowledge with the physicist. In fact all knowledge must be combined, all scientific men must co-operate before this fuel problem can be ultimately solved."

Taken from the program cover, "Boss Kettering, the modern Aladdin making an asset out of a liablity."

"As an illustration of what gigantic strides can be made in the world of science, the war furnishes a good example. Before the war all scientific interests worked relatively independent of each other. Co-operation and the contribution of all our scientific knowledge into one common melting pot made it possible to win the war and it will make it possible for the United States to pay its war debt in fifteen or twenty years. . . . Interchangeable standardization must come. . . . The science of measurement must be further extended to our manufacturing ability and gradually we will evolve out of the dis-similar scientific methods interests that will effectively aid us to work out these problems of the fuel."

Mr. Kettering spoke to an audience of 527. His talk was demonstrated by actual experiments, designed to show what was taking place within the cylinder of the engine. He showed that the theory of alcohol, distilled from agricultural products, to be used as a fuel for our internal combustion engines is fallacious, because over 4,000,000 acres of land would be required to raise enough produce to supply the alcohol.

In this day when the fuel we burn in our motor cars, trucks and tractors is of a very low grade as compared with the fuel as burned in 1914 or even 1916, it is common occurrence to hear a complaint of the "fuel knock."

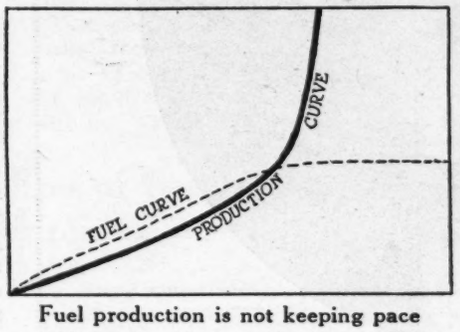
Many engines built prior to 1914 when run on the fuel of to-day are very much inclined toward this fuel knock. In those days compression pressures were fairly high, ranging upwards of 80 lbs., which is in some cases 20 lbs. greater than used to-day. By reducing the compression pressure there is a tendency toward the elimination of this knock, but the sacrifice of power made by the reduction of compression pressure is so great that engines must be constructed larger and heavier in proportion, to produce the same power. This is one of the big problems that the engineer of to-day is combating. The fuel knock can be varied in extent by slight changes in such factors as spark plug location, manifolding arrangement, valve sizes, degree of fuel atomization, combustion chamber shape and hosts of other conditions.

Not a Pre-Ignition Knock

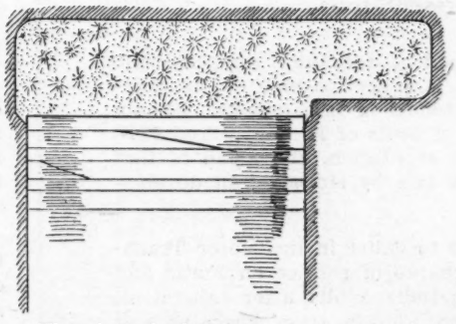
Many of us are inclined to believe that when a fuel knock occurs under a slow and heavy pull, that the knock is occasioned by pre-ignition, simply because it can be eliminated by retarding the spark. Accurate work in the research laboratory proves that the fuel knock is not what might be termed a pre-ignition knock. It is also proved that this knock does not occur before the piston reaches upper dead center. Rather, this knock, it has been found, occurs after the piston starts on its downward journey. A question arises at this point and that is, "How can an explosion which occurs after the piston starts on its downward journey cause such a forceful knock?"

At the moment that the fuel knock occurs, most commonly called the detonation, and for short a "ping," it is held that a great number of minute disruptive explosions occur—blended into one explosion—when the fuel changes its chemical structure. It should be remembered that gasoline is a very complex chemical compound, its constituents being carbon and hydrogen.

Lest this little story on chemical formulations treats of hazy memories it will be well to recall to mind just what is meant by chemical structure. There are something like 8000 chemical compounds on this earth. Water, for instance, is one of these compounds, its chemical formula is H_2O. The label on the bottle of Hydrogen Peroxide states that the liquid is a compound formed of two particles of hydrogen and two particles of oxygen. Water is formed of two parts of hydrogen and one part of oxygen. These particles, as we have referred to them here, are atoms, and the individual atoms that enter into the formation of a particle of a substance represent a molecule. For example, two atoms of hydrogen and one atom of oxygen combine to form one molecule of water.



Fuel production is not keeping pace with automotive production. The curve above illustrates this. Motor Age readers are familiar with the car production curve. The fuel production curve has kept even pace with it until the car curve took such an extremely rapid upward turn. At this point the fuel curve starts to taper off



The free hydrogen atoms acts as miniature spark plugs

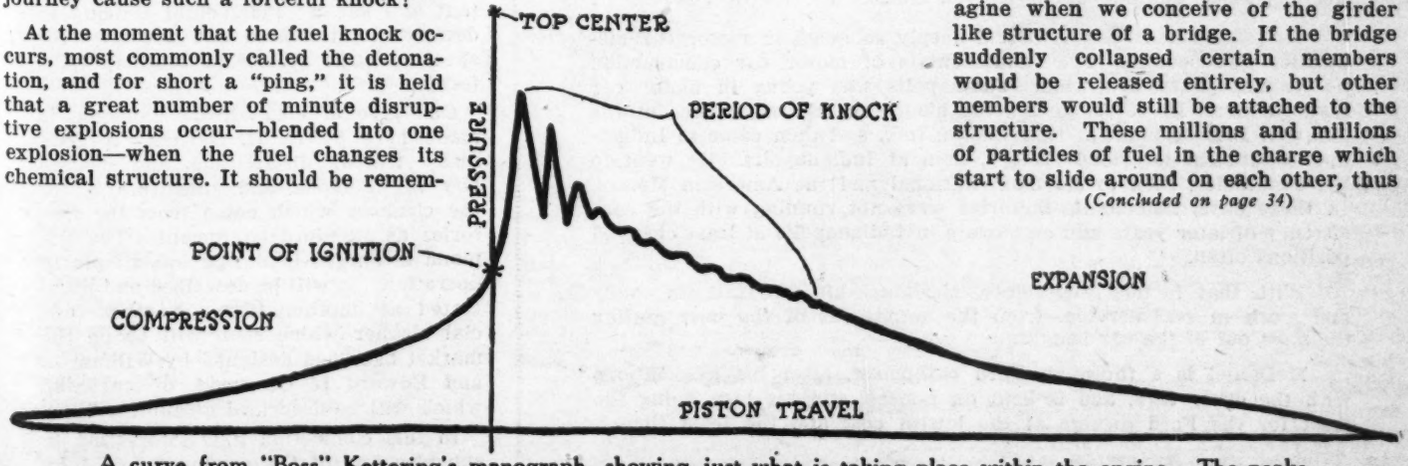
The exact size of this molecule is very hard to state. Lord Kelvin made a very interesting calculation in this regard and stated that if we were to take a drop of water and imagine that this drop of water is expanded to the size of the earth, a sphere 8000 miles in diameter, the individual molecules in this drop of water expanded to this large size would be somewhere between the size of a lead buck shot and a pea. This gives a very good conception of the size of these little fuel particles we are talking about.

Fuel Fractional Distillates

Gasoline and kerosene are chemical compounds, but neither of them has an exact chemical representation. It is probable that the formula C_8H_{18} represents a portion of a good grade of gasoline. Gasoline is a blended mixture of various grades of refined hydro-carbons, and their representations will perhaps vary between the limits C_5H_{12} and C_8H_{18}. It is easily seen, therefore, that this fuel is made up of fractional distillates.

Now at the moment that the spark occurs there is an appreciable lapse or interval between the time of ignition and complete combustion of the fuel, if complete combustion does occur. It is very easy to see that the most volatile, the lightest portion of the fuel charge will catch fire and burn first. This is just what happens. The fuel particles, each belonging to their respective distillate, catch fire and burn in the order of their relative specific gravities, the heavier portions igniting last. Just after the spark has occurred the fuel charge undergoes a very complete and radical change. The chemical structure, which we have referred to heretofore, becomes altered. The fuel particles start to slide around on one another. Their structure is broken up with the result that the atoms that previously represented a molecule of fuel now represent something different and a few atoms are left over to spare. This is not very difficult to imagine when we conceive of the girder like structure of a bridge. If the bridge suddenly collapsed certain members would be released entirely, but other members would still be attached to the structure. These millions and millions of particles of fuel in the charge which start to slide around on each other, thus

(*Concluded on page 34*)



A curve from "Boss" Kettering's manograph, showing just what is taking place within the engine. The peaks after the maximum point are results of the rupture of molecular structure of the particles

C. C. McDaniel, service superintendent, the Frank Hatfield Co., Indianapolis

SERVICE MANAGERS WHO HAVE MADE GOOD

No. 3 of a Series of Articles Telling Why Some Men Are Holding Their Present Jobs

C. C. McDANIEL, service superintendent for the Frank Hatfield Co., Ford agents in Indianapolis, is a service man of big experience and recognized as one of the keenest in Indianapolis. Among Ford owners, particularly the owners of fleets of Ford cars and Ford trucks, the Hatfield service has a big reputation, and much of that reputation may be traced to the work laid by McDaniel in developing it.

Three weeks after he left Hatfield to enlist in the Motor Transport Corps, McDaniel was placed in charge of service on Fords and sent to France in that capacity. From Indianapolis, after enlistment, he was sent to Camp Joseph C. Johnson, Florida, from where he was sent abroad in haste. While McDaniel does not claim to have won the war, he does say that he had some mighty interesting experience keeping Fords running during eleven months' service over-seas.

McDaniels has been well and deeply schooled in motor car mechanics and service. The fundamentals of motor car construction he learned years ago when Indianapolis was young in motor car manufacture. However, he started his motor car experience at the Maxwell Briscoe plant at New Castle, Ind., and then came to Indianapolis with the Overland factory, then at Indianapolis. He went to the Pathfinder, then to Marmon, National and the American Motors. In those days, automobile factories were not running with the consistency of later years and employers in Indianapolis at least changed positions often.

With that factory experience, McDaniel hit the trail for study and work in real service—from the standpoint of the user getting the most out of the car bought.

McDaniel is a thorough Ford enthusiast, after his associations with the other cars, and is bent on himself and his men doing the most for the Ford owners at the lowest cost and the least time.

Orange Groves of Pomona, Cal., Determine Tractor Types

(*Continued from page* 15)

the wheel in this way. Also the flange on the front wheel is made about three inches deep and a sliding drawbar usually replaces the rigid hitch which is standard equipment.

The Fageol, with its spoke wheel, has solved the grouser problem in its own peculiar way. The Cletrac, with its new track and air clarifier, also promises to meet conditions more successfully than did the old model machine.

Dust in orchard cultivation is a serious problem. Normally no rain falls, or but very little, in the orchard growing section from April until about December. As the entire Southern California fruit and grain growing section is in reality nothing but reclaimed desert, and as it would revert to desert within a very few months without water, so irrigation is absolutely necessary. This usually is accomplished by means of a sub-irrigation system, which is largely individual—nearly every orange grove of consequence being irrigated by its own pumping system. The orchardists commonly begin irrigating the groves sometime in May and continue until sometime in November.

Air Cleaning a Serious Problem

The result is that the ground ordinarily is dry on the surface and very soon after it is irrigated becomes dusty. The tractor then usually works in a cloud of dust. This makes the problem of air cleaners a very serious one and one which has not been solved as yet with entire satisfaction. The cleaners which come to California as standard equipment on most of the tractors built in the East, and which answer the purpose fairly well in the East and Central West, are more or less inefficient out here.

Various devices have been resorted to to supplement or modify such cleaners as the Bennett and Donaldson, and there are a number of cleaners being developed out here which are radically different from anything common to the East. This subject is as interesting as important and has a fundamental bearing in determining the kind and necessity for special tractor service in Southern California.

One type of cleaner, the Pomona, is made here by H. H. Garner. A good many tractor distributors and dealers buy the Pomona and substitute it for the cleaners which come from the factories as standard equipment. The Pomona is unique in design but simple in operation. It will be described and illustrated at another time. Another special cleaner which soon will be on the market has been designed by William L. and Edward L. Olmstead, of Anaheim, which will be described at another time.

In this connection it is interesting to consider one of the arguments used by

(*Continued on page* 63)

ADJUSTING THE CARBURETER

The First of a Series of Articles On the Adjustment of All Makes of Carbureters Used as Standard Equipment on All Cars. Makes Using Their Own Carbureters Are Taken Up Individually

BY ROY E. BERG

TO be able to adjust any make of carbureter, on any car, is not an inborn characteristic peculiar to any one set of folk. Rather, it is a capability which can be acquired by anyone, acquired through experience with a knowledge of the fundamentals involved concerning the theory of carburetion. One's forefathers do not necessarily have to be carbureter experts before the shingle proclaiming proficiency in this field can be hung up.

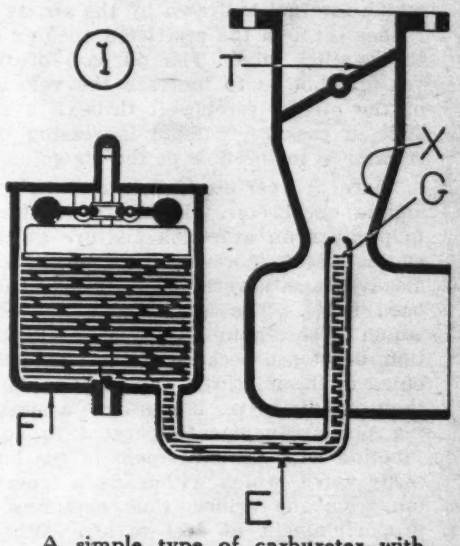
Primarily all carbureters are the same, in that they have but one function to perform, viz., to supply a properly made mixture of air and fuel to the engine. If we bear this fact in mind, rather than that a carbureter of this make requires a certain number of turns of the valve, while that carbureter requires a different adjustment, we will get along further and understand why certain adjustments are necessary.

All carbureters of the present day design have been evolved from one simple type of carbureter. Because this simple type cannot supply the proper mixtures for the engine throughout its full speed and power range, it has been necessary to adopt modifications that will compensate for and provide the mixtures required. These modifications are reflected in 24 different carbureter designs, on 143 makes of cars.

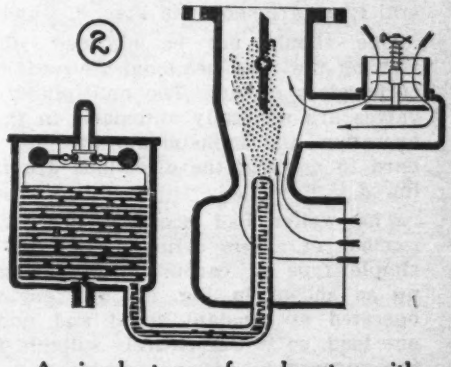
Table of the Makes and Sizes of Carbureters Used On the Various Cars

Name and Model	Carbureter Size and Make
Ace T2	1¼—Strom.
Allen 43	1 —Strom.
American C	1¼—Strom.
American Beauty	1¼—Ray.
Anderson Series 30	Ray.
Apperson Anniversary	1¼—John.
Apperson 8-20	1¼—John.
Auburn 6-39	—Ray.
Argonne	1 —Ray.
Beggs 6	1 —Strom.
Bell	1 —Strom.
Biddle B-5	1¼—Zen.
Bour Davis 20	1 —Strom.
Bour-Davis 21 S. & R.	1¼—Zen.
Brewster	1¼—Strom.
Briscoe 4-34	1—Buick†
Buick K6-45	—Mar.
Buick K6-49	—Mar.
Cadillac 59	1½—Own*
Case V	1¼—Ray.
Chalmers 35-C	
Chalmers 35-B	
Champion C-4	1 —Zen.
Champion S-4	1 —Carter
Chandler	1¼—Ray.
Chevrolet 4-90	1½—Zen.†
Chevrolet F. B.	1½—Zen.
Cleveland 40	1 —Strom.
Climber 4	—Strom.
Climber 6	—Strom.
Cole Aero Eight 870	1½—John.
Columbia C	1¼—Strom.
Comet C-53	1¼—Strom.
Commonwealth 4-40	1 —Carter
Crawford 20-6-40	—Strom.
Crow-Elkhart L-55-4	⅞—Zen.
Crow-Elkhart H-55-6	—Zen.
Cunningham V-4	1½—Strom.
Daniels D	1¼—Zen.
Davis 51	1¼—Strom.
Dixie Flyer H-S-70	1 —Strom.
Dodge Brothers	1⅛—Stew.
Dorris 6-80	1½—Strom.
Dort 15	1 —Carter
du Pont A	1¼—Strom.
Economy 6-46	1 —Zen.
Elcar 6	1¼—Strom.
Elcar 4	1 —Strom.
Elgin Series K	1 —Strom.
Essex A	1¼—Own
Fergus	—Zen.
Ferris	—Zen.
Fiat	—Own
Ford T	1 —H-K†
Franklin 9-B	1 —Own
Gardner	1 —Carter
Geronimo	1 —Strom.
Grant H-X	1 —Strom.
Hanson 54-A	1¼—Mar.
Harroun A-A-2	1 —Strom.
Harvard 4-20	⅞—Zen.†
Hatfield A-42	1 —Zen.
Haynes 46	1¼—Ray.
Haynes 45	1½—Ray.
H. C. S. Special	
Hollier 206-B	1 —Zen.
Holmes	1 —Newe.
Hudson O	1½—Own
Huffman W	
Hupmobile R-4	1 —Strom.
Jackson 6-38	1 —Strom.
Jones 28	1¼—Ray.
Jordan F	1¼—Strom.

Name and Model	Carbureter Size and Make
Jordan M	1¼—Strom.
Kenworthy 6-55	—Strom.
King H	1¼—Ball
Kissel	1¼—Strom.
Klinekar 6-55-J	1¼—Ray.
LaFayette	2 —Own*
Leach	—Ray.
Lexington S-20	1¼—Ray.
Liberty 10-C	1 —Strom.
Locomobile 48	1¾—Own
Lorraine	1 —John.
Maibohm B	1 —Till.
Marmon 34	1½—Strom.†
Marshall K	1 —Zen.
Maxwell 25	1 —
McFarland 127	1½—Strom.
Mercer Series 5	1½—Ball
Meteor K R	1½—Zen.
Metz Master 6	1 —Strom.
Mitchell F-40	1¼— Ray.
Monitor M. & — Ser. 8	1 —Strom.
Monroe S-9	1⅜—Zen.
Moon 6-48	1¼—Ray.
Moon 6-68	1¼—Ray.
Moore 30	1 —Mar.
Murray	
Nash 681	1¼—Mar.
Nash 682	1¼—Mar.
National Sextet BB	1½—Ray.
Nelson D	1 —Zen.
Noma 1-B	1¼—Zen.
Oakland 34-C	1 —Mar.
Ogren 6-60	1½—Opt.
Oldsmobile 37-A	1¼—John .
Oldsmobile 45-B	1¼—Ball.
Olympian 45	1¼—Strom.
Overland 4	1 —Tillot.†
Owen-Magnetic W-42	—Zen.
Packard Twin Six	—Own*
Paige 6-42	1 —Strom.
Paige 6-55	1¼—Ray.
Paragon	
Parenti	—Zen.
Paterson 6-47	1½—Strom.
Peerless Series 6	1⅛—Ball.
Phianna R	1½—Strom.
Piedmont 4-30	1 —Carter
Piedmont 6-49	1 —Strom.
Pierce-Arrow 38	—Own
Pierce-Arrow 48	—Own
Pilot 6-45	1 —Tillot.
Porter 46	2½—Zen.
Premier 6-D	1¼—John.
Reo T-6	1½—Ray.
ReVere C	1⅜—Strom.
Roamer C-6-54	1¼—Strom.
R & V Knight J	1¼—Strom.
R & V Knight R	1¼—Strom.
Saxon	1¼—Strom.
Sayers Six	1 —Strom.
Scripps-Booth B-39	1 —Mar.
Seneca L	1 —Scheb.
Severin H	—Strom.
S. G. V.	
Shaw	—Strom.
Singer 20	1½—Strom.
Skelton	1 —Carter
Spacke S-20	—Carter†
Standard 8-I	1¼—Zen.
Stanwood	—Strom
Stearns SKL-4	1¼—Scheb.
Stephens 80	1¼—Tillot.
Stevens-Duryea	

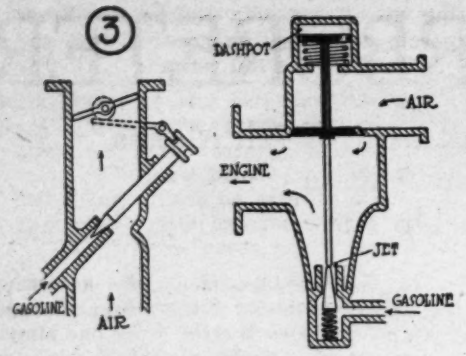


A simple type of carbureter with one nozzle



A simple type of carbureter with air valve for compensation of action of simple nozzle

Name and Model	Carbureter Size and Make
Studebaker E-J	—Strom.
Studebaker E-G	1½—Ball.
Studebaker E-H	1¼—Strom.
Stutz H	1½—Strom.
Templar A-445	1¼—Strom.*
Texan B-38	—Car.
Tulsa E	1¼—Zen.
Velie 48	1¼—Ray.
Velie 34	—Ray.
Vogue 6-55	—Scheb.
Vogue 6-66	—Scheb.
Wasp	1¾—Strom.
Westcott C-38	1¼—Ray.
Westcott C-48	1¼—Ray.
Willys-Knight 20	1 —Tillot.*
Winther 61	1¼—Strom.
Winton 25	1½—Strom.



The control of the metering pin of the Schebler model T

Before taking up the various makes of carbureters and their method of adjustment, let us first examine into the primary or simple carbureter, a view of which is depicted in Fig. 1. The nozzle in this carbureter is an orifice through which the fuel is drawn by the air, as it rushes through the restricted opening of the venturi tube. The purpose of the venturi tube is to increase the velocity of the air by forcing it through a restricted passage, without increasing the resistance to the flow of the air column.

There are certain deficiencies to this simple carbureter. It has a tendency to produce an over-rich mixture as the engine speed increases. To offset this disadvantage, several modifications have been made. The air valve carbureter, which is shown in Fig. 2, is an adaptation, developed because of the over richening of the mixture. Others have more than one air valve. Some have a metering pin arrangement operated in conjunction with the movement of the butterfly valve, which withdraws a tapered pin from the orifice, thus obtaining a proportionment of fuel to air. Others control the motion of the metering pin by the movement of the air valve. Several types are shown in Figs. 3, 4 and 5.

One should not be alarmed when viewing the cross-sectional views of the carbureters shown. The multiplicity of valves are generally automatic in their operation and adjustments are not so hard to make if the directions are followed.

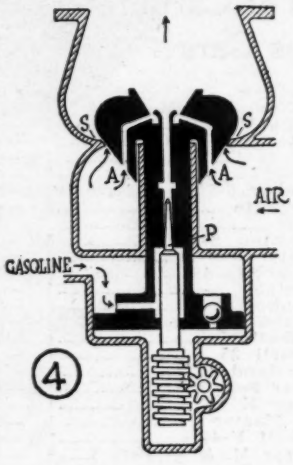
The writer had occasion to test a number of single cylinder engines. A simple type of carbureter was rigged up as shown in Fig. 6. The engines operated at constant speed and under one load, so it was entirely suitable for the purpose.

The proper mixture of fuel to air is about fifteen parts of air to one part of fuel, proportions taken by weight. If the proportions are taken by volume one part of fuel to 8000 parts air are necessary.

Then for accelerating purposes a rich mixture should be supplied to supply the extra power needed and for constant speed driving the mixture should thin down, for the purpose of economy. Carbureters as a rule do not work as delicately as this, but they do perform exceedingly well under all conditions.

Before attempting the adjustment of any carbureter it is well to bear in mind that the operation of the carbureter is contingent upon the condition of the engine as a whole. If the valves are leaky and it is possible to hear the gas leak by the valves during the compression stroke, it is not possible to get the best carbureter adjustment. If all the spark plug gaps are not adjusted correctly, if the breaker point clearance is not correct, if the engine is carbonized, if the manifold has a air leak in it, the carbureter cannot be correctly adjusted. If some economizing valve has been applied to the manifold and interferes with the gas flow the correct adjustment cannot be secured. In a word, when every other thing on the engine is operating as it should, then the carbureter can be adjusted as it should be.

The condition of the exhaust will greatly aid the operator in setting the carbureter. If a strong fuel odor issues

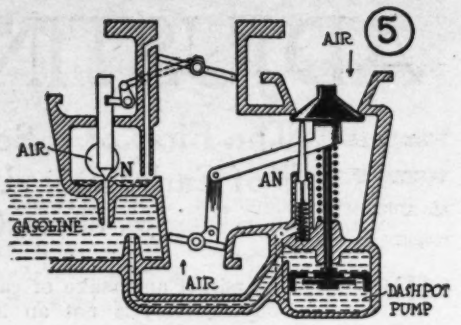


Stewart type with air controlling metering pin

the mixture is too rich. Very often a condition of this kind is reflected by an exhaust of black smoke. Several other indications give unmistakable evidence that all is not as it should be. For example, if the engine continually spits back through the carbureter, it is a sign that the mixture is too lean. Sometimes an engine will have a very black exhaust with the carbureter shut down as lean as possible. Very often this can be traced to faulty vacuum tank operation. Experience will tell when the carbureter needs adjustment or whether it is some other contributory cause producing the evil.

Fig. 7 is a sectional view of the Marvel carbureter. By referring to the list the cars using this carbureter can be determined. In this carbureter the float chamber contains a cork float attached to a valve in such a manner that fuel is admitted to the carbureter only as it is needed to maintain a constant level in the spray nozzle, which is located in the mixing chamber.

The spray nozzle opening is regulated by a needle valve which constitutes the gasoline adjustment of the carbureter and it is surrounded by the venturi tube through which a portion of the incoming



Rayfield uses two metering pins, with a dash pot for acceleration

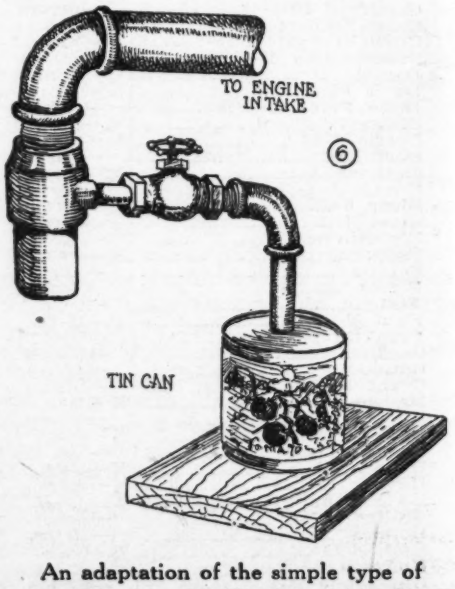
air passes at high velocity, picking up gasoline from the end of the spray nozzle.

The mixing chamber also contains the air valve and the high speed nozzle. The air valve is held to its seat by an adjustment spring which forms the air adjustment. At a high rate of speed the velocity of the entering air increases until the air valve is lifted from its seat and additional amount of gasoline spray is taken from the high speed nozzle.

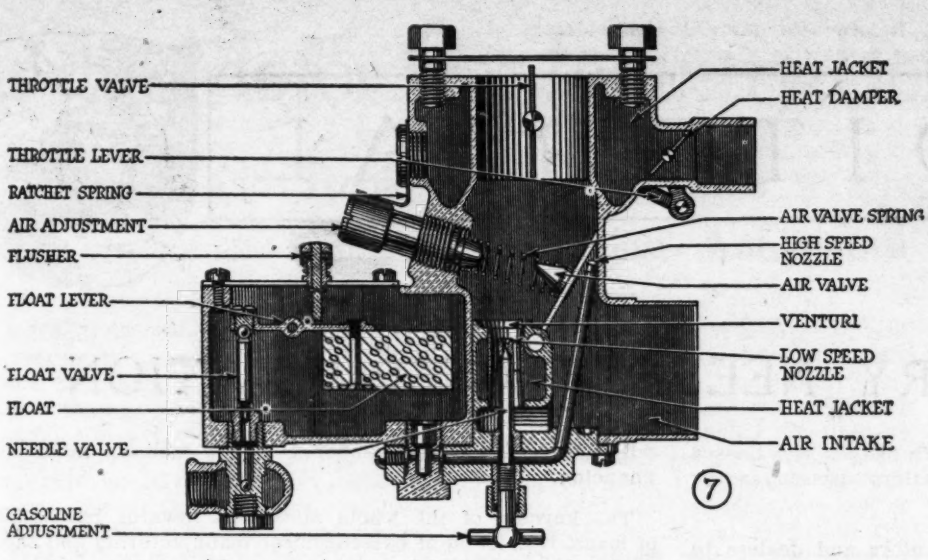
The air enters the carbureter through a three-way valve connected to the air regulator on the instrument board. By means of this valve, the air can be taken from the heater under the exhaust manifold or directly from the atmosphere. In the "choke" position this valve partly closes the air intake, causing the engine to draw excessively rich charges for starting.

The opening between the mixing chamber and the intake manifold is controlled by a butterfly valve which is connected to the throttle lever on the steering wheel and thus determines the amount of gas being fed to the engine.

The upper end of the mixing chamber and the venturi tube are surrounded by jackets through which some of the hot exhaust gas passes to keep the instrument warm and assist vaporization of the fuel. A damper in the jacket open-



An adaptation of the simple type of carbureter, made by the writer for engine testing



A sectional view of the Marvel carbureter

ing is connected to and controlled by the throttle lever so as to increase the amount of heat as the throttle closed. In warm weather the diamond shaped shutter on the bottom of the carbureter should be opened to allow the hot exhaust gas to escape before it overheats the nozzle.

To adjust the carbureter proceed as follows:

1—Turn gasoline adjustment to the right until needle valve is completely closed.

2—Set air adjusting screw, so that end of screw is even with the point of the ratchet spring just above it.

3—Open gasoline adjustment by giving needle valve one full turn.

4—Start engine as usual; allowing it to run a few minutes with air regulator to "Hot" until engine is thoroughly warmed up.

5—With the spark lever fully retarded, turn gasoline adjustment to the right, closing needle valve until engine idles smoothly.

6—Advance the spark lever and turn air adjustment screw to the left, a little at a time, until the engine begins to slow down or skip, indicating too much air; then turn it to the right until the engine runs smoothly.

To test the adjustment, leave spark lever advanced and open throttle lever quickly. The engine should accelerate instantly. If it skips or pops back, open gasoline adjustment slightly by turning needle valve to the left. Do not touch air adjustment again unless it appears absolutely necessary. The best possible adjustment has been secured when gasoline adjustment is turned as far as possible to the right, and air adjustment is turned as far as possible to the left, letting engine idle smoothly and accelerate quickly when throttle is open.

THE STROMBERG CARBURETER

There are several types of Stromberg carbureters on the market. The model employed on the Elgin six, type "L-2" is somewhat different from the one employed on the Marmon. In the case of the former a plain tube carbureter is used and in the latter a metering pin type is used with a dash pot to provide the necessary rich adjustment during acceleration.

Taking the carbureter as used on the Marmon first, which is a Stromberg Type H. It has a fixed size air opening, or venturi tube, with an adjustable gasoline nozzle for low speed and a high speed jet whose opening increases as the auxiliary air valve opens, so that the air and gasoline openings expand in proportion to the demand of the engine. A dash pot at the lower end of the air valve stem prevents valve flutter, also a quick lowering of the intake manifold vacuum, with resulting condensation of the mixture, when the throttle is opened quickly from a nearly closed position.

The low speed adjustment is controlled by a needle valve seating in the primary nozzle opening, which opening is about two sizes larger than usually necessary, thus giving a limit on this adjustment.

An average economical low speed adjustment can often be secured by screwing up all the way on the low speed needle and then unscrewing two and one-half to three full turns.

Should the engine idle too slow and stop with the above setting, turn the throttle adjusting screw in a few turns (clockwise) or should engine idle too fast, turn throttle adjusting screw out a few turns (counter clockwise) until the proper idling speed is reached.

The high speed adjustment is controlled by regulating the position of the auxiliary gasoline needle valve in relation to its seat, which is carried in the air valve stem.

At engine speeds of fifteen miles an hour and above sufficient pressure is exerted on the air valve to lower it and thus permit gasoline to flow past the auxiliary or high speed needle.

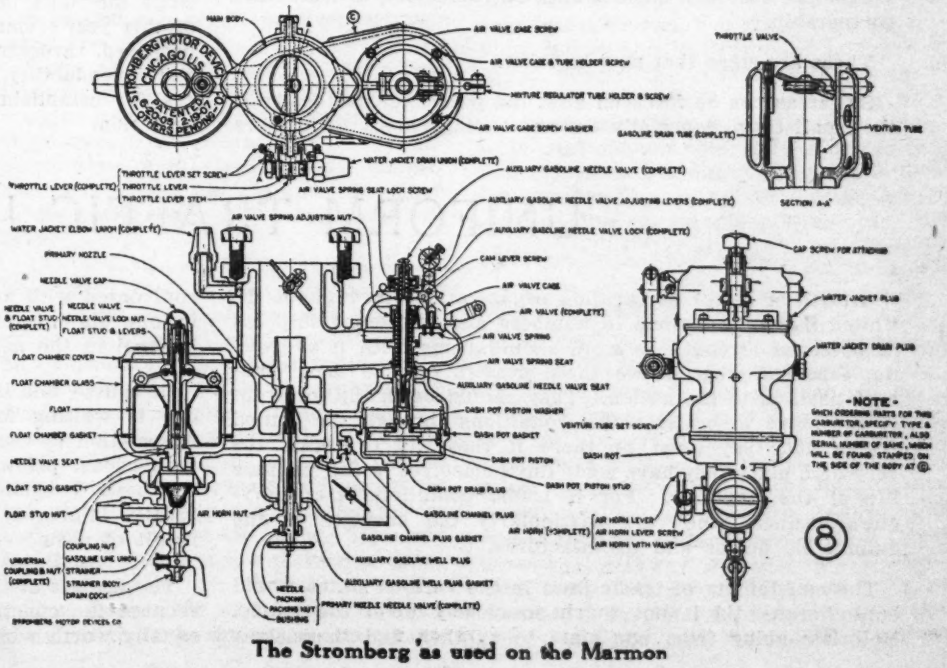
As the auxiliary air valve opens the valve seat travels downward with the valve, thus opening the gasoline inlet. After passing the nedele seat the gasoline rises up along the needle and is delivered into the air stream at the edge of the air valve. The high speed running adjustment is obtained by varying the position of the high speed needle nut downward (clockwise), giving less gasoline, and upward more.

A good way to obtain an average economical high speed adjustment is to screw the high speed needle down all the way, then while flashing the engine unscrew the needle notch by notch until engine ceases to spit.

This type of carbureter is equipped with two controls, one acting directly on the high speed needle and the other on the choker valve in the air inlet.

Under ordinary weather conditions the proper starting can be effected by using only the control which raises the high speed needle, thus enriching the mixture. As the engine starts and warms up this control should be pushed in.

Article Two of this series—Adjusting the Carbureter—will appear in an early issue.



The Stromberg as used on the Marmon

EDITORIAL

THE COUNTRY NEEDS TRANSPORTATION

The Federal Reserve Bank of the tenth district has classed as "undesirable," for the present, dealers' passenger car paper.

In the Kansas City territory, distributors and dealers in passenger car, tire and accessory lines may have more or less difficulty in financing their purchases of stock; they may have to pay higher rates.

It is possible that the restrictions on passenger car dealing and use may extend into other federal reserve districts; even into the manufacturing should the curtailment of distribution not of itself operate to reduce production of cars and tires.

One of the first things garagemen and passenger car dealers should do is to put their shops and organizations into shape to care for the cars, trucks and tractors now in owners' hands. If fewer cars are sold, the burden of passenger transportation will be upon the cars now owned; these cars must all be kept running at highest efficiency.

Truck paper is desirable for rediscount at the Federal Reserve Bank. If this order continues in the tenth district, if it extends to other districts—we will see a large part of the energy and resources of the automotive industry directed to the sale of trucks. We may have to concentrate service and sales on motor trucks.

The dealer who has built a reputation for service, who is equipped to give real service—is the one who can serve his community most usefully, by taking on a truck for sale.

The man who knows himself to be distinctly and primarily a service man, who has no inclination to selling, can serve his community usefully, by associating himself with a passenger car dealer or salesman, in an exclusively truck selling partnership.

These are steps that may be taken.

So far as can be foreseen now, the passenger car dealer in the small town, especially the one selling chiefly to farmers, will not be seriously hampered in his selling, or in his financing.

The keynote of the whole movement towards restriction of loans, restriction of passenger car manufacturing and sale, is the increase of farm production. The farmer must be taken care of. As the situation looks now, no obstacles will be placed in the way of the farmer's purchase of tractor, truck or automobile. It can be put stronger than that: The way will be made as easy as possible for the farmer to get all the money, all the equipment he wants for operating his farm most efficiently.

Labor is not coming back to the farm fast enough. Wages on the farm are too high now—and yet not high enough to attract labor away from factories. The farms must be motorized; the process must proceed faster than it is proceeding now. Twice as many—three times as many trucks and tractors must be used on the farms, and in farm service, at the earliest possible moment. There must be more passenger cars in rural communities, saving the time of those occupied with production and transportation.

The motor equipment on the farms, in the rural communities, must be used more, and with greater efficiency.

Have the bankers seen further into the future service of motor quipment, that the automotive industry itself? Was it necessary for the Federal Reserve System to be established, so that some agency should have sufficient power to force garagemen, truck, tractor and passenger car dealers to grasp their opportunity?

Many, many garagemen have seen this opportunity coming; and are prepared for it. They are prepared to give real service on passenger cars, trucks and tractors—to become the most important factors in the successful meeting of this year's emergencies by their communities. They are prepared, through the reputation they have built for service and dependability, to get the financial support of their bankers for establishment of sales departments, to sell transportation.

UNIFORM TRAFFIC LAWS

Growth of motor car dealers organizations throughout the United States, not alone in numbers and in membership but in potential strength as well, should bring with it a growing sense of what duties these dealers owe to their communities and to the nation. They should be in the forefront of the move to better traffic conditions through the United States and they must be there if they are to retain the very high place they have made for themselves in the business life of the Republic. For if traffic conditions are everyone's business, they are particularly the business of the automobile dealer and manufacturer.

The multiplicity of traffic laws in the various states would be ludicrous did it not touch so closely upon the traffic. Motorists going from one state to another find themselves confronted with an entirely new set of laws. What is legal in one state is illegal in another; what is illegal in one is legal in the next state visited.

Of course this is wrong. No one will deny it. But everyone is waiting for the next fellow to act. The Chicago Association of Commerce has formulated a code of general regulations, printed elsewhere in this issue, which is well worth the consideration of our readers. Perhaps it can be greatly improved upon; perhaps not. At any rate it is a result of some very real study of conditions.

The dealers of the United States were the men who finally secured the enactment of the Dyer anti-theft law. Isn't it equally worth while to have a uniform traffic code?

Is the Motor Car Industry Being Attacked?

Reports and Rumors Would Indicate a Propaganda at Work to Discriminate Against Automotive Business

IMPORTANT developments gravely affecting the automobile industry have come to a head within the last month which prompt many close observers to wonder whether that industry is not to be made the butt of industrial and financial experimentation of an extra-legal nature. So far these developments have been in the form of reports and rumors —hard things to put the hand on, it is true, but nevertheless bearing the stamp of authenticity.

Some of the most important developments of the last month can be stated briefly:

1. The Federal Reserve Bank of Kansas City has refused to rediscount passenger car "paper" offered it by its member banks. While this action is local and is disclaimed as a Federal Reserve policy by other District Banks, it is reasonable that such action would not be taken without due consideration by the Federal Reserve System.

2. Reports, hard to trace and impossible to confirm, state that the steel companies are to divert a large part of their product to the railroads at the expense of the automobile industry.

3. The steel, coal and railroad strikes have all affected the production of automobiles throughout the United States. "How greatly production is affected, only time will tell" is the way our Detroit office, closely in contact with the situation there, sums up the situation.

4. Rumors, also hard to trace and impossible to confirm, are to the effect that the failure of many states to go ahead with road improvement work already authorized, has been caused by propaganda instituted by the railroads and by the formation of railroad lobbies to influence the expenditure of these road funds in a way which would best benefit themselves.

Space limitations forbid going into full details regarding the first of these developments. Suffice it that the Kansas City Reserve Bank recently notified its member banks that hereafter passenger car "paper" would be considered as undesirable for rediscount. It did not actually bar the discounting of automobile paper, but put the passenger car in a class with jewelry, musical instruments, etc., as non-essential businesses. Trucks were specifically excluded from classification with passenger car paper.

The net result of this has been to make money tighter for automobile merchants and as a result it is expected that sales will be seriously affected in the Kansas City district. Individual member banks, of course, are still privileged to accept automobile paper for discount and can use their own discretion in doing so, but with the Federal Reserve Bank unwilling to rediscount this sort of paper, it is certain that credit for the motor car dealers will be less easy to obtain and that rates will be higher.

Other Federal Reserve Banks throughout the United States disclaim any such action as Kansas City has taken, declaring that the Missouri member took this action purely because of local conditions. Officials of the Chicago Federal Reserve Bank even disclaimed any knowledge of the Kansas City action, declaring that it had not come to them through their ordinary channels of information. There was no inclination on the part of the Federal Reserve System, they said, to hamper any industry or business for the benefit of any other. As far as "non-essential" business was concerned, they declared, no discrimination of this sort had been made since the signing of the armistice in November, 1918, and applications for credit were handled on their own individual merits.

Steel Diversion Rumor Hard to Trace

Coming to the second point, the deflection of the steel supply from the automotive to the railroad industry, is in the form of a rumor impossible of verification. Considering the condition of the railroad and their unquestioned need of more and better rolling stock, it would appear that this might be founded upon some firm basis.

When this report came to the attention of MOTOR AGE some weeks ago, an attempt was made to trace it and either to confirm it or obtain denial. An official of one of the leading steel companies was asked his opinion in regard to its authenticity and merely laughed at it.

"It's absurd on its face," he declared. "The steel used in the manufacture of automobiles is of an entirely different grade and process than that which would be furnished for the railroads."

This, however, would not prevent the steel companies from diverting their raw materials to the manufacture of railroad rather than automobile steel. It will be noted in this connection that Henry Ford has already started the manufacture of his own steels and that other big automobile corporations are perfecting plans to the same end.

The Association of Railway Executives, comprising the presidents of all the systems in the United States, will not admit that it has asked the steel makers to divert their products to railroad purposes. It is admitted by them, however, that such a movement is probably under way. Initiative is laid at the doors of the steel makers themselves.

Production Admittedly Is Cut

In regard to curtailment of production, this story has already been told in successive issues of MOTOR AGE. The industry performed marvels in coming through the steel and coal strikes without material curtailment of production, but the railroad strike, combined with an unusually late spring which made highway transportation of raw materials and finished products almost an impossibility was the final straw which broke the camel's back.

Without exception, makers throughout the United States were forced to cut their production from 25 per cent to 75 per cent, while the strike was in progress, and even now when peace has been almost wholly restored, it is doubtful if many of them are on full schedule. Workers have been taken back to work, it is true, and a stupendous effort is being made to have the industry function as usual. The reserve stocks of raw materials have been sadly depleted by the successive strikes of the winter, and in view of the action of the steel industry in making the railroads favored customers, it is impossible to build up these stocks again.

There is little question that production will be badly hit, at least for the next month or two, just at the time when the factories should be running at capacity to supply the peak demand of the year. The industry has performed so many miracles that it is idle to predict what may happen, but it is a certainty that it will take a super-miracle for the factories to live up to their production estimates for the season of 1920.

Interfere with Road Expenditures?

Rumors that the railroads were interfering with the expenditure of road funds are like those regarding steel diversion—extremely nebulous and distinctly libellous if not labelled as rumors. In one state it is said, where there is a big state road bond issue, the railroads have made plans to have all these funds expended upon roads which will merely act as feeders to the railroads rather than for comprehensive state and interstate highway systems, for which they were originally designated. In view of the fact that the motor vehicle is

(Continued on page 34)

Chicago Dealers Stage Annual Used Car Show

More Than 2,000 Machines Are Displayed at Various Times During Successful Exhibition

CHICAGO, April 30—Chicago's Used Car Show, which opened Wednesday for a week's run at the Coliseum, is a monument to the service and used car departments of the local distributors' establishments. For were not the show labeled and advertised as a used car proposition, it is extremely doubtful whether many persons would recognize it as one. Aside from the fact that most of the speedometers show the cars exhibited have been run several thousand miles, there is little outwardly to indicate that the machines on display are not brand new jobs.

Expect to Show 2000 Cars

Big attendance, even greater than had been hoped for, marked the opening sessions of the show. The show was not opened until Wednesday evening but during the afternoon scores of persons interested had to be turned away from the building because they had come thinking the show was to be conducted as the national new car exhibitions and would open at noon. Since opening night, there have been good attendances at all the sessions, even the mornings seeing several hundred persons in the big building.

While the Coliseum will comfortably accommodate only a few more than 300 cars at one time, it is estimated that before the show is closed next Wednesday upward of 2000 cars will have been put on display at the show. Sales have been brisk, hundreds of persons who ordinarily would have bought new cars this year having patronized the used car show because of their inability to get delivery on new machines. Prices have been in keeping with the demand and the increased list prices of most new machines.

Chicago's show is probably the only real service manager's show of the year. The cars on display are all from the regular used car stocks of the dealers, but one would scarcely recognize some of them as such. They have been sent to the service shops and refinished and repaired until they are in almost as good condition as new cars—indeed the reputation of cars sold in the Chicago used car shows is quite as high as new cars.

Many Attractive Displays

Numerous attractive displays are made by the dealers. For the most part the dealers seem to prefer to exhibit used cars of the make they are also handling as regular distributors or dealers but toward the end of the week when their stocks are more depleted, it is expected exhibitions will be forced to fall back upon exhibits of rival cars which they have taken in trades. In this connection it may be noted that the spirit of co-operation in the Chicago Automobile Trade association, which promotes the Used Car Show, is so high that no dealer has the slightest fear that any of his rivals may do anything to disparage any car of his which he may have taken in trade during the year's business.

All cars in the Chicago display have been put through a thorough mechanical examination. This examination has yearly grown more severe until now the tag "Inspected" while in no sense does it carry any guarantee by the trade association, means the car has gone through a test which shows it is almost as good shape as when it left the factory. To illustrate the stringency of the test, it is reported that although exhibitors realized they were sending their cars against one of the most thorough tryouts possible and prepared them accordingly, scores of cars were refused permission for display in the Coliseum.

Aside from the mechanical inspections and overhaulings, many of the new cars are fresh from the paint shops, while all of them are "dolled up" to the best of the ability of the used car departments. Upholstery has been thoroughly cleaned, metal work polished within an inch of its life, bodies repainted or refinished and tops thoroughly overhauled, repaired and glossed up.

One Price Rule Prevails

The one price rule has been made to stick in the show and dealers are thoroughly sold on the idea. Prices are marked on the mechanical inspection cards and the machines must be sold at this price, no cutting or "concessions" being permitted. This rule is almost needless this year on account of the heavy demand for used cars of all sorts but originally was extremely valuable in safeguarding the reputable dealers against the "gyp" dealers and the three- and four-price boys. Officials of the Chicago Automobile Trade association declare that this one rule has done more than anything else to put the Chicago used car industry on a higher plane than anywhere else in the United States.

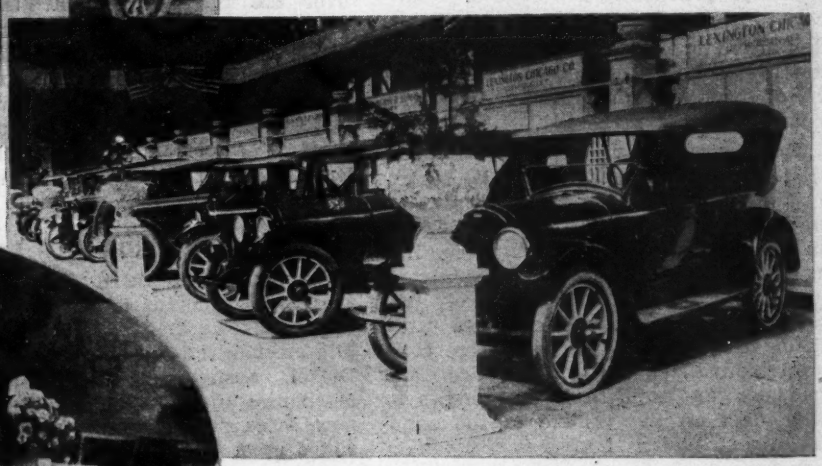
The Chicago Used Car Show has grown far beyond its original purpose and has exceeded even the most optimistic hopes of the men who originated it a few years ago. When the first Used Car Show was held, it was originated in the minds of several dealers who had large amounts of their capital tied up in used cars and who saw little chance of realizing on it readily. At the time demand for cars was far from brisk—it was in the first year of the Great War when dealers all through the country were weeping and gnashing their teeth over conditions—and it was proposed to hold some sort of a Used Car exhibition to "unload" these unprofitable stocks.

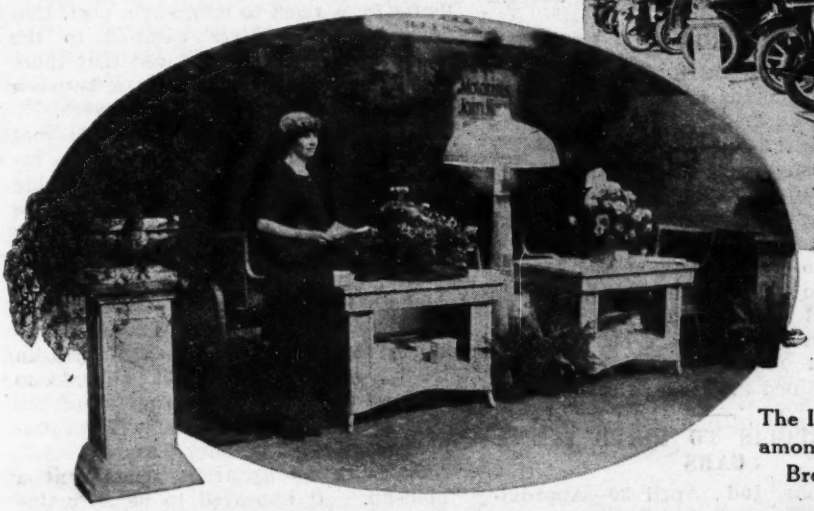
AMBULANCE AND LIMOUSINE IN ONE

If you did not know differently you would take the above car to be a limousine. It is, however, an ambulance, as the lower picture will show. Note the novel manner in which the tire carrier is lowered to form a step. This car is operated in Aurora, Ill., by O. B .Gross. When used as a limousine the seats are let down from the sides

Scenes at the Chicago Used Car Show

At the left, a particularly interesting exhibit of used and rebuilt cars staged by the Chicago Packard branch; below, a view of the main aisle showing how the various exhibits were divided without the use of railings





The Illinois Automobile Club, which has a large membership among the dealers, had a booth in charge of Miss Helen A. Breidert, who conducts the club's touring bureau

A general view of the Chicago Show

Michigan Forced to Limit Truck Loads on Highways to Detroit

DETROIT, Mich., May 3—Deterioration of roadways adjacent to Detroit as a result of the heavy truck traffic occasioned by the railway strike has caused highway authorities to take action limiting the loads hauled over the roadways. Even the most substantial roads have shown the effects of the heavy burdens and the more cheaply built highways practically are ruined.

The situation has brought to the attention of engineers the necessity for a better system of roadways. The widening of the roads and a thicker construction is declared necessary.

The necessity for pneumatic tires on all trucks also is declared to be shown by the effect on the roads in the present emergency. William A. Brush, chairman of the good roads committee, Detroit Automobile Club, who investigated conditions, declared it is absolutely imperative that trucks be equipped with pneumatic tires, eliminating the constant pounding of the solid tire that grinds away even the best roadways. The effect on the vehicle of the solid tire also is stressed.

The folly of building a road too light has been exemplified to an extraordinary degree within the last month. Wayne county and adjoining counties have been noted for the good roadways, and it was believed they were as near perfect as could be. When the strike came, however, and factories began sending fleets of trucks back and forth it quickly became evident they were not built to stand the strain and brought engineers face to face with the issue of a more permanent type of road material and heavier road beds.

A notable instance is the roadway between Detroit and Toledo. A constant stream of heavily loaded trucks traveled over the road during the last three weeks, with the result the road is torn so badly it has been necessary to close a large portion of it to traffic, compelling long detours. Piles of automobile parts and material dumped from trucks, as a result of accidents, strew the highway. Practically all of the factories used this route in getting materials into Detroit.

CINCINNATI MECHANICS STRIKE

Cincinnati, O., April 30—Several of the large Cincinnati garages were affected this week by a strike of automobile mechanics. According to George E. Detzel, business agent of the Auto Mechanics Union, which is preparing a new wage schedule, the companies insisted upon mechanics signing an agreement not to join any union and if they belonged to drop membership. Those who refused were discharged and the remainder walked out, he declared. Detzel claimed 150 were on strike. The dealers declined to discuss the situation.

INDIANAPOLIS TO BUILD 96,500 CARS

Indianapolis, Ind., April 30—Approximately 96,500 automobiles will be produced by the ten motor car industries in Indianapolis this year, and the total sales value of these machines will be $167,337,500, according to B. A. Worthington, chairman of the industries committee of the Indianapolis Chamber of Commerce. His statement was made on a survey of the automobile industry.

The survey shows that 12,300 men are employed in the manufacture of motor cars in Indianapolis, and that the capital invested of about $24,000,000. The value of motor cars to be exported by Indianapolis factories this year is estimated at $5,445,000. These figures do not include capital invested by accessories and parts manufacture of passenger cars.

These figures indicate that 840 cars are made monthly in Indianapolis, or about 28 a day.

SEE COLLUSION IN THEFTS

Philadelphia, April 30—Robberies of trucks en route from Philadelphia to New York, while passing through Bristol, have become so systematic and the thefts have risen to so great a cost, that police and detectives detailed to the cases have become convinced that there is collusion in many instances between the robbers and motor truck drivers.

The latest robbery, so-called, is that of six kegs of valuable chemicals removed from trucks of the Philadelphia Transportation Co. fleet which operates between here and New York.

The police discovered that a small delivery truck had dogged one of the big trucks of the company all the way from Philadelphia to Bristol. The two machines stopped under an arc light in Bristol, according to the police, who were watching, and the transfer of the kegs was made quickly and without disturbance, from the large to the small truck, with no apparent attempt at a "hold-up." It appeared to be a furtive business transaction. Thousands of dollars' worth of cloth and other merchandise is reported to have been "taken" in this manner.

EDGAR SUCCEEDS ELMER APPERSON

Detroit, April 30—Edgar Apperson, secretary and treasurer and general manager of Apperson Bros. Automobile Company at Kokomo, Ind., was named president to succeed Elmer Apperson by the new board of directors at a meeting in Kokomo this week. T. E. Jarrard was continued as vice-president and A. G. Dawson, one of the new directors, takes over the duties of Mr. Apperson as secretary and treasurer. At the stockholders meeting preceding the election of officers Mrs. Elmer Apperson was elected a director in place of her late husband. Other directors are Edgar Apperson, Mr. Dawson and Mr. Jarrard.

WOMAN HEADS TOURING BUREAU

Chicago, April 30—Miss Helen A. Breidert has been appointed in charge of the newly organized Touring Bureau of the Illinois Automobile club. The Illinois club was organized this winter by many former members of the Chicago Motor club and is composed largely of Chicago dealers and others interested in the motor car and truck industries.

Miss Breidert was formerly head of the Touring Bureau of the B. F. Goodrich Rubber Co. and is regarded as one of the most competent authorities on road conditions in the United States.

Indiana Men Form Highway Transport Organization

INDIANAPOLIS, Ind., May 1—Motor truck dealers, manufacturers, tire interests and oil merchandisers have joined with motor truck users, with Indiana shippers and receivers to form the Indiana Highway Transport association, a body of business men, bent on the development of the motor truck as a carrier in Indiana.

The association is rightly financed and has the support of business men who until very recently have rather stood in the way of the development of highway transportation, believing that so far as Indiana was concerned, the steam roads and the interurbans were nearly sufficient.

However, with the switchman's strikes, with factories in Indianapolis and other industrial centers shutting down because of lack of supplies, with the city population threatened with hunger because of possible food scarcity, and with the motor truck, quickly organized, taking on these transportation burdens, these business men, with the Indianapolis Chamber of Commerce behind them, came to the conclusion that the motor truck and highway transportation in Indiana should be developed to its highest point.

Conferences of business men interested resulted in the formation of the Indiana Highways Transport association and the acquisition of the C. I. & W. freight house as a receiving and shipping station, where the truck lines running in and out of Indianapolis could unload and load their freight.

The freight house is six blocks from the center of the city, is 49 by 100 ft., with a loading platform of 2500 sq. ft., with ample office space for right administration.

The president of the association is Roy Adams, Indianapolis; vice-president, Lewis Taylor; secretary, Indiana Federation of Farmers; secretary, Tom Snyder, secretary Indiana Transfer and Warehousemen's association; treasurer, C. W. Abrahams, Indianapolis.

Rates established are high enough that the truck owner is sure to carry on his business profitably—high enough that with better organization and the development of return loads, may be reduced. Some shippers have complained already that the rates are too high. Some others say, however, that it is based on the service given, the rates are fair enough as a starter. Truck lines have failed because rates were established which did not permit of a fair profit to the truckman.

The rates to and from Indianapolis are:

One to ten miles, 3 cents per cwt. per mile. Terminal charge, 12 cents.

Ten to 25 miles, 2 cents per cwt. per mile. Terminal charge, 12 cents.

Twenty-five to 59 miles, 1¾ cents per cwt. per mile. Terminal charge, 12 cents.

More than 50 miles, 1½ cents per cwt. per mile. Terminal charge, 12 cents.

TRUCK OWNERS IN MEET

Toronto, Ont., May 3—The Ontario Motor Truck Owners' luncheon and meeting held recently at the King Edward hotel, at which nearly 200 operators assembled to hear the Hon. F. C. Biggs, minister of public works and highways, discuss "Truck Transportation and Road Construction." Mr. Biggs explained the important and radical legislation on commercial vehicles.

Cincinnati Automobile Club Plans Million Dollar Garage

CINCINNATI, O., May 3—A $1,500,000 garage-clubhouse, five stories in height, for the Cincinnati Automobile Club and its 5,000 members, became a certainty to-day when Dr. C. L. Bonifield, president of the club, signed a contract with the Frederick A. Schmidt Co., real estate dealers, for its construction.

Under the contract, the Schmidt Co. is to form and incorporate the Cincinnati Automobile Club Garage Co., and members of the club are to be given first chance at the stock. Initial capitalization will be $10,000, but this will be increased later to $1,000,000.

Preliminary architectural plans show that the garage will be a unique structure. Its main entrance will lie alongside the telephone company's building on Fourth street, with other entrances on Sycamore and Hammond streets. Though five stories in height, it will contain no elevators. A decided street slope in that vicinity will permit street level entrance to most of the floors. Ramps will give entrance to the upper floors. Aisles will be 15 ft. wide to allow plenty of room for machines.

The present plans call for a building of 1000 cars capacity. Negotiations are under way for additional tracts which, if obtained, will permit an extension of the building to Third street, with another entrance, and increase the capacity to 1525 cars.

The club rooms are to be placed on the top floor, it is planned. This will be decided at a meeting called for next month to pass on the final plans of the architects.

The decision of the club to build a new clubhouse and garage was made several weeks ago when it became practically certain that Cincinnati's new traffic rules, which are to be put up to City Council in a few days, would prohibit downtown parking of automobiles. The club directors were faced with the prospects of having automobiles legislated off the streets, with no place to park them, and several propositions were taken under consideration before the Schmidt project was finally settled on.

It is understood that this building will not interfere with the plans of a group of Eastern capitalists, represented by C. T. Abele, to erect another large public garage in a suitable downtown location for automobiles of the general public.

TO SHOW CARS AT FAIRS

Buffalo, May 3—Importance of automobile exhibits at the county fairs of New York state is gaining the recognition it deserves. Among others the directors of the Genesee County Fair at Batavia plan to erect a large hall exclusively for automobile and tire displays. The building of this fair ground will be 250 by 60 ft., and will be of permanent type, costing upwards of $30,000. Directors of the fair board meeting in Batavia recently expressed belief that county fairs will grow in the future in direct proportion to the space and attention given motor vehicles.

CANADIANS PLAN GOOD ROADS

Buffalo, May 2—Good roads from Buffalo and Niagara Falls to Detroit, through Canada, is planned by the provincial highway department of Ontario. The road will be constructed from the Niagara River west through Welland, where it will join the Talbot road leading to Saint Thomas, Chatham and Detroit. The Canadian roads have long been notoriously bad and the announcement of the improvement plans will be welcomed by American tourists.

SEIZE CARS FOR SMUGGLING

Buffalo, May 1—Motorists who, after passing through Canada seek to bring liquor from the Dominion into the United States, run the risk of having their machines seized. A custom's department ruling now in effect along the border provides that failure to report an export may result in the seizure of the vehicle used to transport the export. In all cases of detection of concealed liquor motorists have been forced to give deposits to obtain release of their cars, pending an interpretation of this ruling.

St. Louis Tire Men Join in Rates On Service Work to Customers

ST. LOUIS, April 30—Notices now are posted in all establishments operated by members of the St. Louis Tire Dealers' association, bearing on service charges, in accordance with resolutions recently adopted by the association. The following instructions are given on the posters:

Charge of $1 to be made for store-door mountings with new tire if it was not purchased from man making charge, unless a new tube is purchased. Repairing tube not to count.

No charge for puncture change at store door, unless new tube purchased from some other dealer is used. If such new tube is used, charge is to be $1.

Free delivery of new tubes purchased in first zone. For all other zones, charge one-half of zone charge to the price of tube for delivery of new tube.

If he is not a regular customer charge when having four or more tires, zone price for service calls and $1 for store-door service.

No charge for service if owner has previously purchased a tire from you, if service is on your tire. If on other makes, zone charge or $1 for store-door charge is to be made.

Even if owner is a customer, zone charge is to be made if you are asked to put on tires not purchased from you.

The city and suburbs are divided into zones, the charges being $2 for zone 1; $3 for zone 2; $4 for zone 3 and $4 for zone 5.

AIR SERVICE FOR CINCINNATI

Cincinnati, O., April 30—Captain J. Allan Brookes, London, representing the United Airways Corp., is in Cincinnati conferring with Cincinnati capitalists relative to placing Cincinnati on a proposed $5,000,000 serial passenger and freight route that is to be established between Chicago, Washington, Baltimore and New York by this company.

If a suitable landing place can be found in Cincinnati, this city will be made the headquarters for a Southern route to New Orleans. Another route is to be outlined from Chicago to the Pacific Coast. Planes to be used will carry eight passengers or a ton of freight with ease, he said.

Chicago Commerce Body Urges Traffic Rules

Code of Uniform Regulations is Recommended for Adoption By Various State Legislators

CHICAGO, April 30—Months of investigation on traffic problems in all parts of the United States have resulted in the formation by the Street Traffic Committee of the Chicago Association of Commerce of a code of traffic rules and regulations which are to be submitted to state legislative bodies throughout the United States for uniform adoption. The need of such rules has long been felt in the United States, but this is the first time an organization of the standing of the Association of Commerce has taken definite steps in this direction.

Changes in present traffic regulations as proposed by the Chicago association are far from radical and are rather making present rules really uniform than innovations. The suggestions cover only five general regulations but if adopted by the different states will make a nationally uniform traffic system covering speed limits, signaling, passing vehicles, lights and traffic signs. The scores of lesser traffic regulations required to meet local conditions are left entirely to local authorities.

STRIKE CAUSES GAS SHORTAGE

Philadelphia, April 30—The shortage of gasoline, especially during the railroad men's walkout, caused considerable trouble throughout the state. The Atlantic, Gulf and Crew-Levick companies in Philadelphia established motor truck deliveries in many directions, supplying gasoline to keep the trucks of different cities going. The Atlantic Refining Co. recently has been making large purchases of motor trucks, besides adding to its huge fleet from its own motor truck factory at Point Breeze.

Some tank distributors in the large cities, like Reading, ran so low in supply that some tanks virtually were empty. The Gulf Refining Co. delivered thirty truckloads in a few days, in Reading, from Philadelphia, the average truckload being 515 gallons. The three big companies contrived to meet fairly well the demands of Reading and the county, which is estimated at 160,000 gallons daily.

The mayor of Scranton caused a ban to be placed on the sale of gasoline for passenger cars, for several days. There commandeering of gasoline for motor trucks engaged in intercity deliveries of foodstuffs and milk was in progress throughout the strike. The mayor held a consultation with the oil and gasoline dealers before taking any steps.

UNIONTOWN DEALERS ORGANIZE

Uniontown, Pa., May 3—Local automotive dealers have perfected an organization with E. C. Ricks as president, J. Q. Adams as vice president and George B. Smith as secretary-treasurer. The name of the organization is to be determined upon, the constitution and by-laws adopted and the general plans for the association's activities are to be adopted at a meeting early in May.

The association is the outgrowth of a recent automotive show in which twenty-six local automotive dealers participated. The association plans to advocate legislation in behalf of the automotive industry, to indorse good roads by working actively for the construction of additional highways, to secure adequate markers for all highways in the county and to further projects for the development of the industry locally.

Mr. Ricks is head of the Ricks Motor Co. Mr. Adams is head of the Central Garage, now the largest in Fayette county, and Mr. Smith is sales manager of the Standard Garage.

Traffic Rules Proposed by Chicago Association of Commerce

SPEED

Not to exceed thirty miles per hour outside of city limits.

Not to exceed ten miles an hour in closely built districts.

Not to exceed fifteen miles an hour in residence districts.

Not to exceed twenty miles an hour in sparsely settled residence districts.

Six miles an hour around corners and at road curves.

LIGHTS

All vehicles must carry lights from sunset to one hour before sunrise. Vehicles other than those motor driven must carry one light visible from both front and rear. Motorcycles and motor bicycles must carry one white front and one rear red light. All other motor vehicles must carry one light on each side showing white lights only to the front and one lamp showing red to the rear. No colored lights of any kind may be shown to the front and all lights must be visible for 200 feet. Dimmers must be used on glaring lights within 500 feet of approaching vehicles.

SIGNALING

Comprehensive signals in some form should be obligatory upon drivers of all vehicles before coming to a stop, slowing down or turning.

Horns must be sounded upon approaching curves or hilltops.

Where whistle signals are used, one blast will release north and south traffic; two blasts, east and west; three blasts, danger, stops all traffic.

PASSING

In passing, vehicles must give a fair and equal share of the road.

In meeting, all vehicles shall pass to the right. In overhauling, all vehicles shall pass to the left.

Vehicles overtaking street cars in motion, pass to the right. Stop at least ten feet to the rear of any street car halted to take on or discharge passengers.

Car Prices Will Go Up on June 1, Detroit Report

Makers Forced to Increase By Higher Labor and Material Costs—Trucks Also Affected

DETROIT, Mich., May 1—As forecast in MOTOR AGE two months ago, plans now are being perfected for an increase in the price of automobiles June 1, which will affect virtually the entire industry. The continued increase in the cost of parts and material with the end not in sight, in the opinion of many factory executives, makes a still further increase imperative. This also is true with the truck end, and substantial increases are expected to be announced at intervals between now and June 1.

Maxwell-Chalmers increased the price of Maxwell passenger cars $100 on closed car models, effective Friday, and Chalmers cars were increased $150 on both open and closed. There will be no increase in the price of Maxwell trucks at this time.

Sales Manager B. A. Lyman said today the increase effective Friday was the only one in contemplation, and certainly there would be no further increase as of June 1. Maxwell open models now are selling at $1155 at the factory; the coupe $1795, and the sedan $1895. Chalmers seven-passenger touring model now is listed at $2095; five-passenger touring and roadster, $1945; sport model $2145; four passenger coupe, $2645; sedan $2795. Maxwell truck chassis with solid tires remain at $1322.

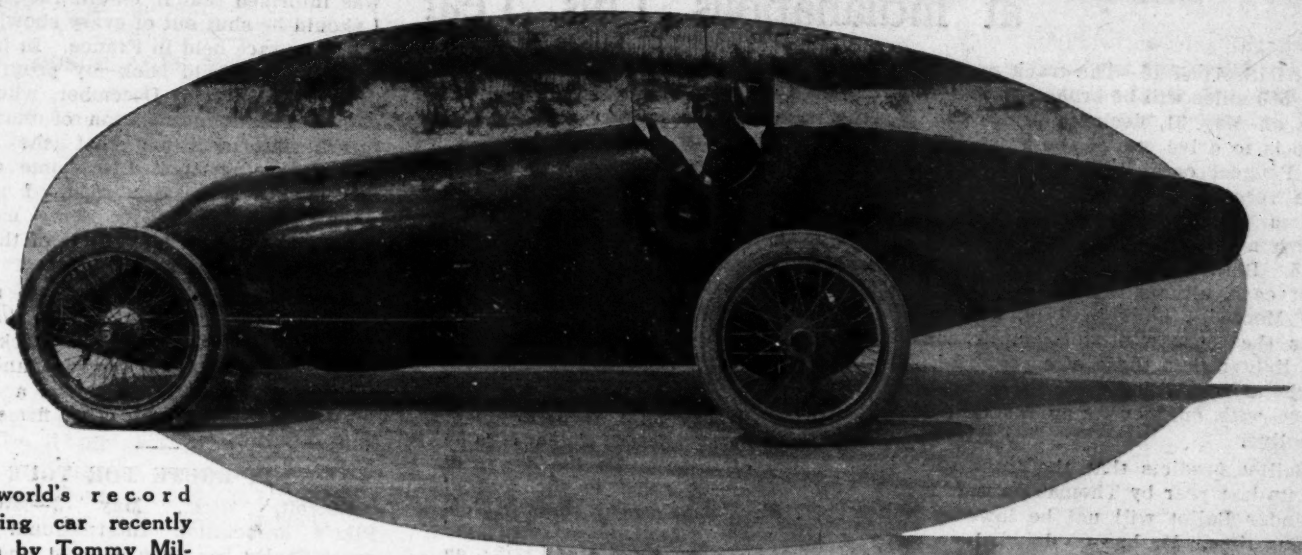
Factory executives have held frequent conferences within the last week discussing the high price trend of parts and material and its effect on the price situation. Detail cost estimates based on future receipts of materials have been compiled and the result, it is said, in most instances, makes the price increase inevitable. In some instances the increase will be greater than any other announced heretofore, though the effort will be made by all manufacturers to keep the price as low as is consistent with good business.

TIRES SHOW BIG INCREASE

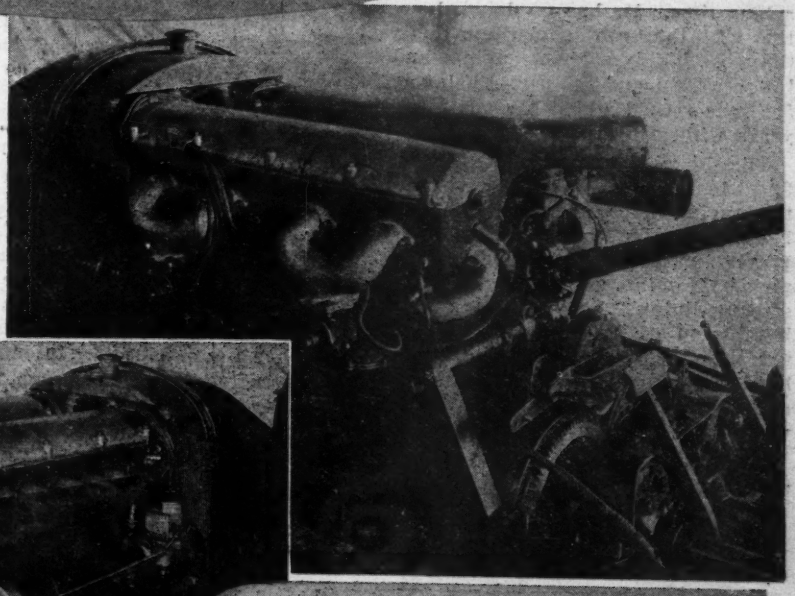
Akron, May 1—Production of automobile tires has kept pace with the amazing growth of Akron in population. The 1920 census figures show the city now has a population of 208,435, an increase of 201.8 per cent since 1910. Akron's increase was the largest thus far reported and places it just below St. Paul which has 234,595 people. This city has gone ahead of Kansas City, Kas., Dayton, Memphis, Nashville, Syracuse and Albany.

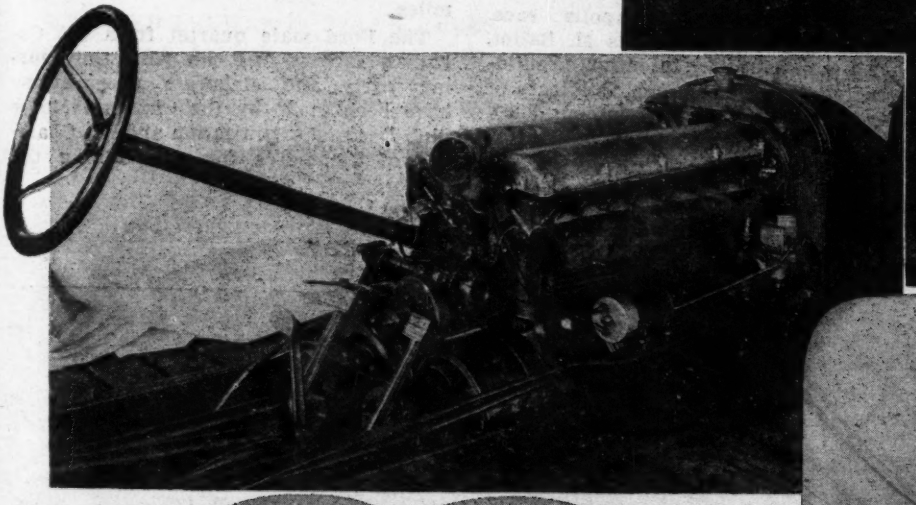
Tire production figures for 1919 show an equally astounding growth over those of 1919 in the four leading factories of the city. Goodyear Tire & Rubber Co. leaped from $13,262,265 in 1910-1911 to $167,315,857 in 1918-1919 with 30,393 employees in Akron.

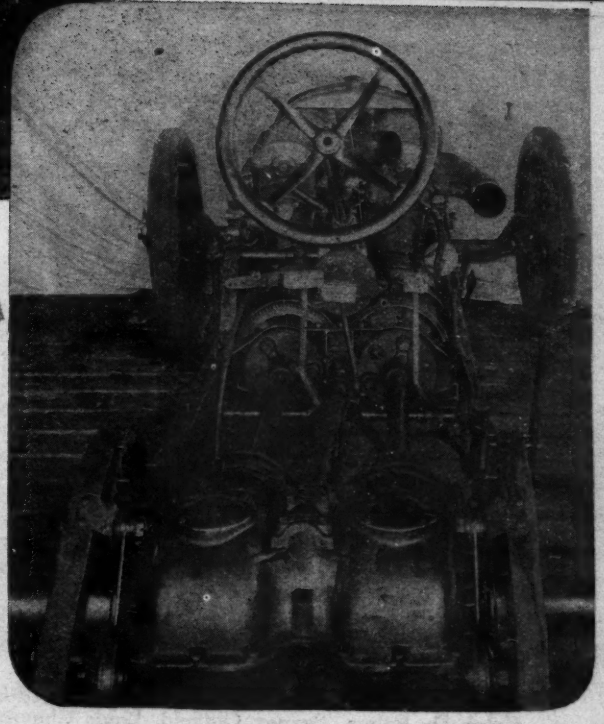
First Views of the World's Fastest Motor Car



The world's record smashing car recently driven by Tommy Milton at Daytona, Fla., uses two eight-cylinder Duesenberg engines. There is no transmission or differential, the propeller shaft from each engine running direct to the rear axle, with a central torque tube. The spring saddles are under the axle, which is a steel tube 62 mm. in diameter operating in a ball-bearing spring seat. The drive is such that any variation in speed between the engines is equalized, thus eliminating chance of accident should one engine cease firing







Boillot Predicts New Record at Indianapolis This Year

PARIS, April 15—The track record for 500 miles will be broken at Indianapolis on May 31, declares Andre Boillot, who is to drive one of the three 183 cu. in. Peugeot cars entered in that event. The record is at present held by De Palma with the Grand Prix Mercedes which averaged 89.84 miles an hour in 1915. Boillot claims that the new Peugeot cars, although much smaller than the Mercedes built in 1914, are faster than the German production. The cars are lighter than those of a year ago and ought to be able to cover the entire distance with only one stop for tires and gasoline.

Boillot predicts that the track record set up last year by Thomas on the eight-cylinder Ballot will not be lowered for a long time. He has no doubt, however, that with the keen competition this year, the more highly efficient engines and the lower weight and the better balance, the 500 mile record which has stood for five years will go by the board.

The Peugeot racing mounts are the finest looking machines ever produced by the racing department of the famous French firm. With a very low centre of gravity, narrow radiator, staggered sets giving the minimum width, and complete stream lining, they give a wonderful impression of speed and stability. To get weight low down and to diminish head resistance, all the gasoline is carried alongside the propeller shaft. Front wheel brakes are used.

The engine is an entirely new production having four block cast cylinders measuring 80 by 149 mm. bore and stroke. There are three camshafts and 20 valves for the four cylinders. Engine and gearbox form a unit attached directly to the frame members without the use of a sub-frame. The cars have been thoroughly tested on the road and are reported to be very fast and to have a remarkably quick pick-up. Boillot and Goux will leave for New York on the Lorraine April 17. Their three cars are being shipped on same date by another steamer.

Buffalo, May 2—In Pennsylvania to drive an automobile so as to splash mud on a pedestrian's clothes is to be guilty of assault. So the courts of Franklinville, ruled in the case of W. W. Waring against Eugene Roberts, whose automobile splashed mud on the spring suit of Mr. Waring, an attorney. A warrant was obtained and the driver was fined $5 on a charge of assault, third degee.

The French syndicate of automobile manufacturers is responsible for the delay in the completion of the Ballot cars prepared for the Indianapolis race.

"Last September," declares M. Ballot, "when I announced my intention of building racing cars, the French Syndicate of Automobile Manufacturers informed me that they did not wish any of their members to take part in racing during the year 1920. As I am not a member of this Syndicate, for I only manufacture engines and not complete cars, I notified them that I did not attach any importance to their decision. Immediately I was informed that if I built racing cars I should be shut out of every show, exhibition or race held in France. In face of this threat I held back my programme until the month of December, when the official French association of manufacturers informed me that the order against racing applied to home events and not to contests abroad. I got to work with the loss of three months, owing to this jealous attitude of the official body."

Every effort is being made to regain the lost time, but it is certain that the Ballot cars cannot be on the track until about one week before the race, and consequently are likely to be at a disadvantage compared with other firms.

PICK ROUTE FOR TOUR

Detroit, Mich., May 3—Michigan Pike's association International Tour route finally has been decided upon and the recently defined provincial highway, which also is the Transcontinental Roosevelt Highway between Windsor and London, Ont., will be used. The first day's run starting, July 14, will be through Maidstone, Tilbury, Chatham, Wardsville and London. From Chatham to London the tour will follow what is known as the Longwood Grove, shortening the first day's mileage thirty-four miles.

The Ford male quartet from the Canadian factory will be with the touring party and elaborate preparations have been made by the Chatham Motor Club Dealers' organization and the Chamber of Commerce for entertaining the visitors.

You'll See Them All at Indianapolis This Year

Some of America's leading race drivers snapped before Moro Castle, Cuba. From left to right are Ira Vail, Tommy Milton, Ralph De Palma, Barney Oldfield, Louis Chevrolet, Joe Boyer, Dodson, Eddie Hearne, Cheney and Bill Pickens

Capt. W. S. Gilbreath, manager of the Detroit Automobile Club, who has been appointed chairman of the speakers' committee, will have charge of ninety-three good road meetings to be conducted on the tour.

BOSCH ADDS $3000 TO HOOSIER PURSE

Indianapolis, April 30—The American Bosch Magneto Corp. has added $3000 to the winner's share of the Indianapolis Sweepstakes purse. The Bosch company makes this offer contingent only on the winner's using a Bosch magneto. The company has made this special prize award for several years.

L. M. BAKER JOINS DITTMER

Lockport, N. Y., April 25—L. M. Baker has resigned as supervisor of sales of the motor equipment division of the Hyatt Roller Bearing Co. to take over the Michigan representation of the Dittmer Gear & Mfg. Co. His new headquarters will be in Detroit.

UNIONTOWN PLANS FOR RACES

Uniontown, Pa., April 30—Plans are shaping up for the Universal trophy race, the season's opener at the Uniontown Speedway, on June 19. The distance will be 225 miles and entries specify cars of 183 cu. in. piston displacement. Plans now formulated call for but two racing meets on the Uniontown Speedway this summer.

NEED LEEWAY IN TRUCK RULES

Boston, April 30—The big wool firms which operate a fleet of motor trucks are asking to have the parking privileges in the wool district stretched out so as to facilitate their work. As a result thirty of their representatives appeared before the Street Commission yesterday and appealed for dispensation permitting them to park their machines more than twenty minutes in the wool district, since motor vehicles have become indispensable in their business and some of the warehouses are half a mile from their offices.

TRUCK MEN ORGANIZE

Pontiac, Mich., May 4—The Pontiac Transportation association was organized here last night by thirty-three truck and draymen. Improved truck conditions are announced as the object of the organization, which will have an office on Perry street. V. C. Nettleton is president of the new concern; F. Clark is vice-president; A. Leach, treasurer and John Hollinger secretary and general manager. An effort to have all truck and draymen in Pontiac affiliated with the association will be made.

WILLET TALKS TO BUFFALO S. A. E.

Buffalo, N. Y., April 30—J. G. Willet, of the Sterling Oil Corp., addressed the Buffalo Section of the S. A. E. Wednesday evening at the University club. Mr. Willet talked on controlling and atomizing the fuel by various pressures of the engine.

Tommy Milton Cuts More Time from World's Speed Record

DAYTONA, Fla., May 2—A painful although not serious injury to his left eye forced Tommy Milton to forego the completion of his attempts to corner all world speed marks here after he had set new marks for all distances from one-half to five miles. Milton was unable to make attempts at the marks for ten and twenty miles, which thereby remain in the possession of Ralph De Palma and the Packard.

After his trials Tuesday, when his car caught fire, Milton complained of trouble in his left eye. Physicians were unable to tell him whether he was suffering merely from dirt in his eye or whether the trouble was more serious, but ordered him to postponed any other trials and hurried him to Chicago for a consultation with optical specialists there. In Chicago a small piece of steel was drawn from the cornea of his left eye. The accident will lay the star Duesenberg driver up for about a fortnight, but he declares he will be ready to drive one of the Duesenberg entries at Indianapolis.

Milton made his first trials for the new world's marks on Saturday, April 24, when he lowered the marks held by Ralph De Palma in the Packard in the half-mile, mile and two mile. Although he had established new records, Milton was not satisfied with the performances of his car and extensive alterations were made, notably lowering the body about two inches. On Sunday he tried for new records for the three, four and five mile courses and was successful in all of them.

Bad weather prevented further trials on Monday, but on Tuesday Milton again went after the half-mile, two mile and one kilometer marks, bettering his Saturday performances in each of the distances. At the close of his two mile trial his car caught fire and he was forced to run into the ocean to extinguish the flames. He planned to resume trials Wednesday, but the accident to his eye prevented. Inasmuch as it would be impossible to utilize the electric timing device for distances above five miles, Milton's failure to try for the ten and twenty mile records is of little import.

All Milton's trials were timed by Fred J. Wagner, official representative of the American Automobile association with his electrical timing device.

More details on the construction of Milton's Duesenberg are available since the last issue of MOTOR AGE. The car has two eight-cylinder Duesenberg engines for its power plant, each engine driving one of the rear wheels. There is no transmission or differential, the propeller shaft running to each rear wheel and the torque tube located in the center. The rear axle is a steel tube 62 mm. in diameter, which revolves in a ball-bearing spring seat.

When the car was first shipped to Daytona, A. A. A. officials had notified Duesenberg that no reverse would be required on a beach car, but later changed their ruling. Duesenberg solved the problem by using a reversing arrangement composed of a disk which, when in place, comes in contact with the flywheels of both engines. The driving arrangement is such that it eliminates possibility of accident should one engine fail to operate.

WORLD SPEED RECORDS

(Made by Tommy Milton in 16-Cylinder Duesenberg car at Daytona, Fla.)

Date.	Distance	Time	M.P.H.
Apr. 27	One kilometer	14.40	155.37
Apr. 27	One-half mile	11.57	155.57
Apr. 27	One mile	23.07	156.04
Apr. 27	Two miles	46.24	155.75
Apr. 25	Three miles	1:12.18	149.55
Apr. 25	Four miles	1:36.14	149.77
Apr. 25	Five miles	2:00.04	149.97

They take to motor racing in Havana. The photograph here shows the betting ring at the Havana track during the recent four day meet there, with all the entries listed in the Mutuel machines

ATTACKS ON MOTOR CAR INDUSTRY?

(Continued from page 25)

constantly becoming a more and more dangerous competitor of the railroad in its most profitable service—the short-haul freight work—this rumor may not be as absurd as some would have us believe.

The National Automobile Dealers' association has made an investigation of the action of the Kansas City Federal Reserve Bank and reports that it has found that this action is strictly local; that no other banks of the system are following the example. The action of the Kansas City bank, according to Harry G. Moock, general manager of the association, was caused by the heavy rural demand for cash to finance spring planting.

The National Automobile Chamber of Commerce has made an investigation of the steel diversion rumor and, according to Alfred Reeves, general manager, strongly questions its authenticity. The N. A. C. C. takes the ground that the industry is too well established as an essential one for any discrimination to be practiced against it, but concedes that it is possible that some share of raw materials may be diverted from it to supply other equally essential industries which at the present time have not been getting their full share of the nation's output.

NEW CADILLAC PLANT IN ATLANTA

Atlanta, Ga., April 30—A modern automobile establishment costing approximately $150,000 is to be constructed by the Atlanta Cadillac Co. on property recently purchased by the company at the cost of $55,000. Plans are now being drawn for the new building.

The new home of the Cadillac company here will be three stories in height with a basement. It will be a permanent fireproof structure and will be located in the heart of the new automobile district. All equipment is to be the latest and most modern furnished for automobile houses.

DRIVEAWAYS BECOMING FREQUENT

Philadelphia, May 1 — Driveaways from western motor car factories are going strong. Preparations therefor were started on an unusually large scale in some houses when the railroad men's strike came and the work is being continued.

Notable among the big driveaways arriving in Philadelphia were two big truck trains of the White Co., driven over the road from Cleveland to Philadelphia headquarters, 112 North Broad street. In the first there were ten trucks and in the second twenty. It took five days for the run, or an average of a little more than 100 miles to the day. The total mileage is about 687.

Walter Y. Anthony, general manager of the Philadelphia Packard Co., expects to continue this method for Packard cars from the factory in Detroit until railroad traffic has become thoroughly stabilized. Other concerns are inclined to do likewise. The Packard company has had more than 75 cars driven in from Detroit during April. There is a general demand for expert pilots. Firms that hitherto have not been over-particular about having experts, also have decided to eliminate any farm boy and roustabout round-ups for this sort of work, for in the past it has proved poor economy on account of the great damage wrought to machines on the road by careless drivers.

New Pennsy State Law Cuts Motor Car Thefts in Half

Philadelphia, May 2—Thefts of automobiles have dropped off fifty per cent as the result of enforcement of the new State motor vehicle law, according to Captain Souder, of the city police detective force.

The figures apply from January 1 to date, in comparison with the corresponding period of last year. Captain Souder attributes this result to the new laws, their enforcement and the penalties attached to their violation.

The added efficiency given to the detective bureau in its effort to recover stolen cars likewise is evident upon the police records. Since January 1, 1920, detectives have recovered 82 per cent of the automobiles stolen in this city, as compared with recovery of 67 per cent for the same period last year. Virtually all of the higher priced cars that were stolen during the first three months of this year have been recovered, so that the percentage of actual money loss due to thefts is much less than at any period during the last few years, during which time there had been much scandal over the delay in recovering stolen cars and the lack of effectiveness in recovering any considrable number.

DISCUSSING THE FUEL PROBLEM

(Concluded from page 19)

breaking up their structure begin a series of detonations.

The first of the series of these detonations occurs when the heat and pressure are sufficient to cause that fraction of the fuel with the lowest ignition point to catch fire. Then the burning of this fractional distillate raises the temperature and pressure in the combustion chamber to the point where the distillate with the next highest igniting point, catches fire. The burning of this one creates the necessary heat and pressure for the next, et cetera.

As was mentioned above, when the structure of the molecules collapse several atoms are left over. The tendency is for free atoms to combine with other free atoms, providing that they have a mutual attraction for one another. Most of the atoms are combined to form other compounds of hydrogen and carbon and the few hydrogen atoms that are left over become scattered around through the mixture. Now, hydrogen has the property that it burns very very rapidly. In other words, it can transmit flame at a very high rate of speed; its rate of flame propagation is rapid. With these hydrogen atoms scattered around through the mixture and the various fractional component parts of the mixture in a receptive mood to catch fire and burn they start the series of violent detonations that culminate into one disruptive explosion that we call the fuel knock.

The hydrogen particles are free and since they burn very very rapidly the flame darts from one hydrogen atom to the next with great rapidity. There are perhaps several millions of these hydrogen atoms that catch fire first. They serve the purpose, practically, of establishing great numbers of spark plugs scattered around through the mixture and from each one of these burning atoms the fuel particles belonging to the most volatile fractional distillate in the neighborhood of one particular hydrogen atom catch fire and burn. These atoms igniting the fuel particles for the first fuel fraction, and the second fuel fraction, and the third, and so on, providing, practically, an infinite number of small spark plugs provide the means that produces the fuel knock.

As regards the various methods employed to eliminate this fuel knock or "ping" it is very plain that lowering the compression pressure is a poor scheme at best, for it reduces the power of the engine very materially. Carburetion will greatly assist in the elimination of the fuel knock. If a carbureter was designed so that it atomized the fuel so finely that it would be divided almost to its molecular form, then it is probable that we would have eliminated the fuel knock entirely. Carbureters, though, have not been developed to this stage of perfection as yet. Latest developments toward the elimination of the "ping" modify the shape of the combustion chamber. Mr. Horning, of the Waukesha Motors Co., has made some improvements in which the combustion chamber is shaped to represent a conic section, with which he has secured wonderfully promising results.

It has also been found that by adding different chemicals to the fuel that the fuel knock can be eliminated. Adding a compound that will combine with the free hydrogen particles to form a compound of as slow a burning rate as the fuel itself will eliminate the knock. It happens that if a small amount of iodine is added to the fuel (1.5 to per cent by weight) this will be accomplished. Coal tar extracts, such as analine, also have a similar tendency.

Because of the difficulty of determining just what takes place within the cylinder developments in fuel combustion do not offer a lucrative field for investigation. Experimental processes are necessarily slow because new engines embodying the constructive differences found from the previous models must be designed and built individually. Work of this nature is not accomplished with the greatest of speed, but there are great needs for development work of this nature.

Although Los Angeles had to stage its first used car show in a tent, this didn't detract from making it an attractive one as the accompanying photographs show

Tent Houses First Los Angeles Used Car Show

LOS ANGELES, May 3—Under the auspices of the Used Car Dealers' association, Los Angeles recently had its first exclusive used car show. From the standpoint of sales made and interest created in used cars the show can be said to have been a success. After all, that is what counts most in an undertaking of this nature and the fact that the attendance was surprisingly small did not prove any serious handicap as the percentage of sales made to the number of visitors was exceedingly high.

Owing to lack of a suitable building in which to present the show a tent, 180 by 350 ft. was used. The Motor Car Dealers' association, representing the new car dealers, all of whom have their own used car departments, was invited to participate in the show but did not avail itself of the opportunity. In this the new car dealers probably lost as much as they could have benefited the show through their prestige, as they lost all advantages to be gained from the show advertising.

There were 136 cars in the show at all times. The rules permitted withdrawal of sold cars and replacements within certain hours. Each exhibitor was limited to a space to accommodate four cars and he paid $100 for it. The tent was decorated neatly and placarded but exhibitors were permitted to add to the embellishment at their own expense if they desired. Music was furnished by a jazz band and Hawaiian orchestra and vaudeville performers added entertainment during evening hours.

The Used Car Dealers' association had had no previous experience with shows and W. M. Parker, a professional promoter, was employed to serve as manager. The association appointed a committee to work in co-operation with him. This committee was composed of F. B. Calvert, secretary of the association, Daniel Thomason, J. A. Campbell, Charles Maguire, Wayne Young and S. G. Stephens. The cost of the show to the association was approximately $10,000 and although it is doubtful if the gate receipts equaled that sum, those who participated regard the money as well spent.

One of the requirements exacted of exhibitors was that the cars shown must be in first class condition from the standpoints of appearance and mechanically. This brought about such a brilliant display that, with few exceptions, if the tires were not inspected and the speedometers read it was difficult to realize that every car had seen service. There was absolutely nothing that smacked of the abused car and each sale was made with a positive guarantee of the car's condition, supported by the dealer, who is bound through membership in the association to make his word good.

There was only a few low-priced cars on display and all of these that represented real bargains were disposed of the first day of the show. The cars that were on display ranged in price from $600 to $7500. The latter figure represented a high-grade, enclosed job that had been rebuilt mechanically, repainted and upholstered. Considerable interest was displayed in a Ford with a special body that was priced at $1100. A 1902 model Ford car that was not for sale but entered merely to attract interest presented a strong contrast to the dolled up offering.

Solicitation of business was in a very genteel manner. The salesmen on duty and their tactics presented an example in deportment that well may be emulated by others in the same line of work who daily stand at the front doors of their employers' places of business and hail each passerby with a question concerning his interest in automobiles. The initial event was not without its little incongruities and what there were of these can serve toward improvement of future shows as the Used Car Dealers' association proved conclusively to the public that it is a well-established organization and undoubtedly in the future its undertakings will be patronized liberally.

FORD MEN BACK AT WORK

Columbus, Ohio, May 3—Employees of the Ford branch in Columbus, numbering 500, who have been idle for several weeks because of inability to secure supplies from the factory, have been notified to report for work as sufficient supplies have come in. The plant has been working on full time prior to the suspension.

Indianapolis Makers Endorse the Open Shop

Automobile Manufacturers Also Join in Move to Revise State Tax Legislation

INDIANAPOLIS, April 30—Resolutions endorsing the open shop among manufacturers in Indiana, among whom are the manufactories of all automotive products, and the recommendation of the revision of the state tax law to make it more equitable, were adopted at the sixth annual meeting of the Indiana Manufacturers' Association at the Claypool hotel.

J. L. Kimbrough, of Muncie, was elected president; W. F. Taylor of Indianapolis, vice president; Linn Faulconer, of Seymour, second vice president; Fred C. Gardner, of Indianapolis, treasurer. S. L. Jones, of Anderson, F. M. Ruddell, of Kokomo, R. C. Stickel, of Terre Haute, and Oscar Soderquist of East Chicago were elected members of the board of directors.

James A. Emory, of Washington, general council for the National Manufacturers' Association, speaking of the condition of chaos in the country, said that while dark clouds seem to be looming, he could see daylight ahead, for he had an abiding faith in the American people.

ESSEX WINS TRACK RACE

Atlanta, Ga., May 3—Sig Haugdahl piloted an Essex to victory in the fifty mile Southeastern derby held here on the dirt track at Lakewood Park Saturday, covering the distance in 52:43. Howard Claypool, with a Case, came in second, leaving the third place to Burr Lampkin, at the wheel of another Essex. The purse was $2500, of which the winner took $1500, leaving $750 and $250 respectively to the second and third drivers.

The race drew a big crowd of Atlanta fans who put their stamp of approval on the racing game by the roar of applause with which they greeted the announcement that the Southeastern Derby will be an annual affair in Atlanta. Close driving and neck-and-neck thrills held the fans up to a keen pitch throughout the race. Bob Kline, driving a Briscoe, plunged through a fence in the midst of the five-mile race, but came clear of the wreckage which resulted when his car came to a rest after three somersaults. Kline suffered only a few scratches and was able to handle a car in the polo race, in which he brought his team out winner.

SERVICE MEN AID CONVENTIONS

Portland, Ore., April 30—The entire forces of the Portland Garage and Repairmen's association will be mobilized for public service here in June during the national conventions of the Mystic Shrine, Kiwanis clubs and T. P. A., and the Portland Rose Festival, which will bring thousands of outside cars into Portland.

It is not a money-making scheme, this organized activity on a big scale, but the association's civic contribution to helping Portland make these events a huge success. A uniform scale of prices, not exceeding the published lists, is the keynote of the parking, servicing, and garaging programme outlined by Albert N. Stanton, who has been appointed director of service. He is prepared to provide service for 4,000 additional cars a day, if necessary.

The garage association will officially supervise all garaging and parking of automobiles during the period from June 14 to June 21. The city will close certain streets for parking, leases will be obtained on many other properties, and direction, as well as through use of vacant lots and vacant buildings by automotive concerns, the motor car congestion will be handled.

FORD BUILDS 4,300 CARS IN DAY

Detroit, April 30—Ford Motor Co. established a record for one day, when on March 27, 4,256 cars left the factory. The nearest approach to this record was on a day in May, 1917, when 3,868 cars and trucks were turned out. Of the total turned out March 27, 3,756 were cars and 500 trucks. Up to the time the power ban was placed on the factory as the result of the strike, the company's production record, while never able again to reach that day's figure, hovered around the 3,500 mark. Despite this enormous output, Detroit dealers and those in territory within 200 miles of this city have sold their allotments, and delivery of new Fords cannot be promised before fall.

WISCONSIN MAKERS IN SHOW

Milwaukee, Wis., May 3—A mammoth made-in-Wisconsin Exposition will be held at the Auditorium in Milwaukee from May 22 to 30, under the auspices of the Milwaukee Journal, the largest daily newspaper of the city, which has secured the backing of commercial and civic organizations. Practically every manufacturer of passenger and commercial cars, tractors and other automotive products has engaged space. This will be an important feature of the exposition, since Wisconsin now ranks as one of the largest producing states in the entire country, especially in motor truck and tractor manufacture.

KANSAS CITY PLANS TRUCK TOUR

Kansas City, Mo., May 3—The truck division of the Kansas City Motor Car Dealers' association has referred to its special committee, the preparation of plans for a truck tour this summer. One of two programs will be adopted: Either a truck tour on a definitely large scale will be arranged in connection with the motor car dealer's association annual tour, or a special truck event will be staged covering two or three weeks, in the harvest season. A. R. Kroh of the Goodyear Tire & Rubber Co., delivered an address advocating truck tours.

Macon Dealers Prepare for Great Motor Show

Believe Exhibition Will Be Most Successful of Year in Southern Territory

MACON, Ga., May 3—The latest report of the Macon Automobile Dealers' association shows thirty-two passenger car entries and several truck and tractor entries in the Macon Automobile show, which will be held here May 5, 6 and 7. The show is arousing greater interest than any previously held here.

Space in the show has been reserved by practically all of the Macon automobile dealers and there is little floor space left in the Grant-Waters building and the Lamar building, where the show will be held. The dealers are receiving cooperation from the Chamber of Commerce and other local organizations and expect to put across a big show.

NO PHILADELPHIA TRUCK TOUR

Philadelphia, May 2—The board of governors of the Motor Truck association of Philadelphia has decided that the association this year will hold no "ship-by-truck" tour on its own account, but it has endorsed, for the association, the "ship-by-truck" tour among the farmers to be started by the bureau of the Firestone Tire & Rubber Co., on May 17, lasting until the 24th. This tour will extend through southeastern Pennsylvania, southern New Jersey, Delaware and Eastern Maryland.

The following committee has been appointed to co-operate with the bureau: John D. Howley, O. W. Doolittle and Thomas K. Quirk.

The Motor Truck association of Philadelphia will hold its annual outing on June 12, at the Mohican Club, on the Delaware. The Philadelphia Automobile Trade association and the Camden Automobile Trade association will accompany the members as guests on the run in automobiles to the Mohican club and return. There will be a baseball game at the outing point between the Motor Truck association nine and a team from the Camden association.

JOBBERS' PROFITS 5 PER CENT

New York, May 1—Net profits of twenty-five automotive equipment jobbers in the eastern district average 5 per cent, according to replies to a questionnaire analyzed at a meeting here of the Eastern Automotive Equipment association. The questionnaire, sent out to more than fifty members of the association, brought in only twenty-five replies, several of the members who did not answer explaining that they had not completed figures on their last fiscal year and were unable to make intelligent answers.

It was the general consensus of opinion that a jobbers' business must be handled with efficiency and system if he is going to make even the average 5 per cent net.

South Carolina Dealers Set Dates for Meeting

Isle of Palms is Site of Convention of Motor Men, Scheduled fro June 24-25

COLUMBIA, S. C., April 30—The semi-annual meeting of the South Carolina Automotive Trade association, which will be held in Charleston at the Isle of Palms on June 24-25 will be opened with a great automobile parade, according to plans announced by Santo Sottile, president of the Charleston Automotive Trade association, which will act as host to the convention. The parade will be headed by Metz's military band and its is planned to have every make of car sold in the state in the parade.

The convention promises to be the largest gathering of automobile and accessory men ever held in this section of the country. There are 957 registered automobile dealers in the state, and it is expected that over 500 of this number will attend the convention. There are many accessory dealers in the state and they are also expected to turn out in full force.

A. Mason Gibbes, president, and Harold C. Booker, secretary of the association, are working hard on the program for the business sessions and will be ready to give it out in a few days. Invitations have been extended H. B. Harper, president of the National Automobile Dealers' association; Ray W. Sherman, editor of Motor World, and J. O. Munn of the John O. Munn Company of Toledo, Ohio, and it is thought that all three will attend and deliver addresses.

The Charleston dealers are planning to make the social side of the convention a brilliant feature. There will be dancing, a banquet, and other attractive events on the program.

The Isle of Palms, at which the convention will be held, has one of the best beaches in the South and the dealers are looking forward to some dips in the surf.

The growth of the South Carolina Automotive Trade association since its organization has been little less than marvelous. Organized on Oct. 30th last, with a membership of 65, it now has over 250 members and the list is growing daily. A vigorous campaign for members is now in progress. Eight new applications came in one day this week from one city, Orangeburg.

PORTLAND DEALERS ORGANIZE

Portland, Ore., April 30—Fifty motor car dealers from various parts of the state met last week in Eugene, Ore., and perfected temporary organization of the Oregon Automotive Dealers association, a state-wide body which will affiliate with the National Automobile Dealers association. Robert E. Magner, field representative for the National association, assisted in the organization. The dealers will meet again in Portland in 60 days to complete permanent organization, Mr. Magner in the meantime to campaign the state for additional members.

Will J. Lester, president of the Portland Garage and Repair Men's association, petitioned the Eugene meeting to admit the garage and repairmen to full membership. This was not provided for in the tentative constitution adopted, but Mr. Lester is prepared to fight hard for admittance at the permanent organization meeting in Portland.

FORD FIRMS TO CONSOLIDATE

Lansing, Mich., April 30—Consolidation of the Ford Motor Co. and Henry Ford & Son Corp. is seen in the application for admission to do business in Michigan of a new corporation organized under the laws of Delaware. The corporation will have a capital stock of $100,000,000, twice as large as limited capitalization of any corporation organized under Michigan laws.

Besides the manufacture of automobiles, trucks and tractors, the new corporation is empowered to manufacture aircraft, internal combustion locomotives, railroad cars and other transportation devices. The fact that the Michigan law limits corporations to a capital of $50,000,000 is declared to be the reason for incorporating in Delaware when all of the property of the corporation is in Michigan.

That the corporation is for the purpose of consolidation is indicated in the fact that the stock will not be placed on the market, but rather is for the purpose of enlarging the activities of the companies. Incorporators are Henry Ford, Mrs. Henry Ford and their son, Edsel B. Ford. The present capital of the Ford Motor Co. is $2,000,000 paid in in cash, patents and property. The capital of Henry Ford & Son is $1,000,000 paid in cash.

MAY LOAD DRIVEAWAYS

Detroit, April 30—A plan to in a measure relieve the congestion in freight, as a result of the railway strike, and assist shipper and consumer, has been suggested by J. T. Ross, traffic commissioner of the Chamber of Commerce, who urges the loading of driveaway fleets. It is his contention that a great volume of goods could be moved out of Detroit to driveaway destinations, loading the cars so lightly as to not cause a strain.

The plan appears feasible and is being given serious consideration by factory executives and dealers. With several hundred cars leaving Detroit and vicinity every day thousands of pounds of goods could be shipped to Ohio points, Chicago, Louisville, New York, Philadelphia and in fact, to cities from 200 to 1000 miles in almost every direction. Hundreds of cars from Flint, Pontiac and Lansing and scores of trucks pass through Detroit every day.

TO ELECT ACCESSORY OFFICERS

St. Louis, April 26—The annual election of the St. Louis Motor Accessory trade association will take place at the City Club on May 11.

Milwaukee Association Is Newly Organized

More Comprehensive Policy is Adopted and Accessory Division May Be Formed

MILWAUKEE, Wis., May 3—The reorganization of the Milwaukee Automobile Dealers, Inc., under the name of Milwaukee Automotive Dealers' association, has been completed by the formation of distinct divisions of passenger car and motor truck distributors and dealers. The question of forming an automotive equipment dealers' division is still under consideration.

The Passenger Car Division has elected these officers: Jesse A. Smith, Hudson and Essex, chairman; C. P. Hatter, Buick; W. H. Krueger, Locomobile; H. W. Bonnell, Kisselkar, and Leslie D. Frint, Olds.

The Motor Truck Division's officers are: M. D. Newald, chairman; Harry P. Robinson, W. H. Upham, R. W. Osborn and A. Perego.

President Thomas C. McMillan of the general association has announced the following standing committee appointments:

Shows—William F. Sanger, chairman; Joseph G. Millman, R. W. Leach, A. Perego, H. J. Lear.

State Legislation—Frank J. Edwards, chairman; M. D. Newald, C. P. Hatter, W. H. Krueger, W. H. Sims.

Tours—W. P. Upham, chairman; L. D. Frint, R. D. Rockstead, J. A. Van Etta, H. J. C. Henderson.

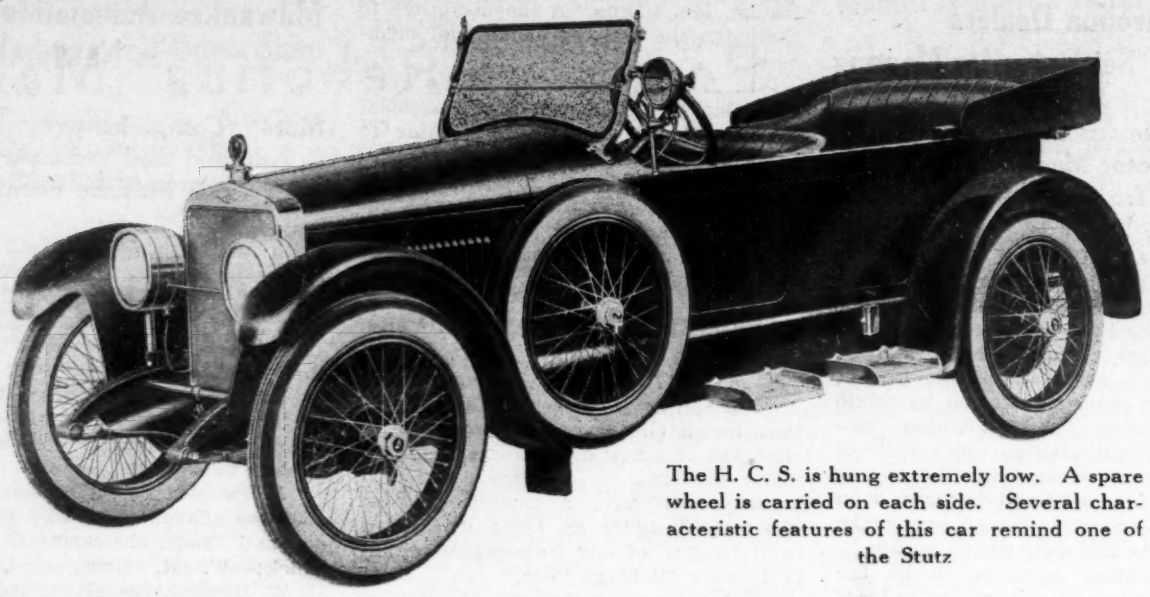
Local Legislation—R. C. Chidester, chairman; F. W. B. Achen, Alfred Reeke, H. W. Bonnell, W. E. Bowen.

The association is one of the pioneers among local organizations of distributors and dealers, having been formed in 1908. Its activities have been original and effective, and widely copied by similar associations. Bart J. Ruddle, who has been assistant secretary and manager since the inception of the organization, becomes executive secretary of the newly created parent body.

KANSAS CITY MEN SEEK CREDITS

Kansas City, Mo., May 3—The Motor Car Dealers' association of Kansas City is seeking ways to meet the conditions brought about by restrictions of the federal reserve bank on financing of dealers. One definite part of the program, is the association backing which will be extended dealers who may not be able to secure financing on cars ordered. So far no dealer has been embarrassed, all being able to get money needed to handle shipments.

The motor securities companies have run into the difficulty of securing money, some reporting having to pay 10 per cent for loans. They are getting on a stricter basis as to terms, owing it is said to a program of lending to 50 per cent of value, and six months instead of a year for time.



The H. C. S. is hung extremely low. A spare wheel is carried on each side. Several characteristic features of this car remind one of the Stutz

THE NEW H. C. S.

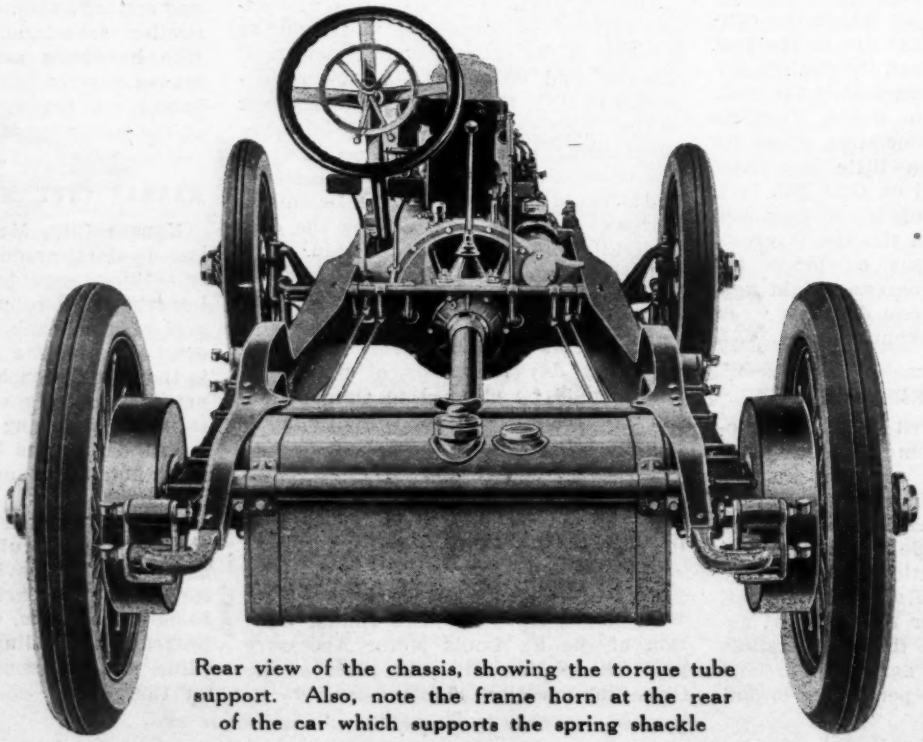
Harry Stutz's Latest Design Has Feature of Great Accessibility, Center of Gravity Very Low

THE H. C. S., Harry Stutz's new creation, which attracted such wide attention at the New York and Chicago shows, and which was illustrated in MOTOR AGE at that time, is presented here in its detailed form. The car is of four-passenger capacity. Its center of gravity is very low, the height of the windshield being less than the height of an average man. The seating arrangement provides ample space even though the car is as low as it is. Individual step plates are used instead of the running boards.

The body is mounted on a 120 in. wheelbase chassis. The engine is mounted in the frame on four points. But two cross members are used in the whole frame of the car and the engine because of its mounting serves the additional purpose of providing strength for the frame.

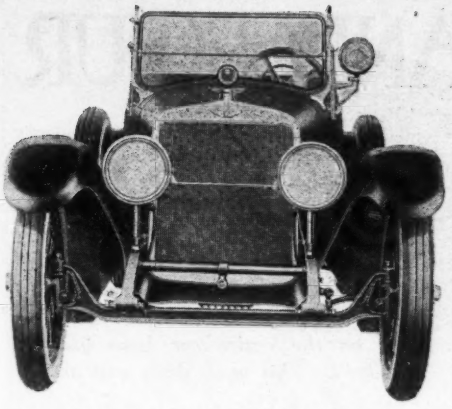
The engine has four cylinders, is block cast and completely enclosed. The upper and lower section of the engine crankcase is of aluminum and the cylinders are of cast iron. A bore and stroke of 3⅝ in. by 5½ in. gives the engine a rated horsepower of 21.3, but in actuality over 50 horse power is developed. The front end of the crankshaft is fitted with a Lancaster vibration damper. This is a device that reduces the torsional vibration of the shaft by absorbing this vibration between resilient disks. The valves are fitted in the head, which is made removable for accessibility. The valves are 1⅞ in. diameter in the clear. This large valve with its overhead location insures a maximum of power development. The connecting rods of the engine are of the four bolt type, a practice that is coming into more and more use as larger bearings are being adopted.

The lubrication of the engine is of the force feed type with a gear driven gear pump forcing the oil to each main bearing through the hollow shaft. The overhead rocker arms which are enclosed within the aluminum cover over the engine are also force feed lubricated. A special ball and socket joint is used on the ends of the push rods engaging with the rocker arms, which are always immersed in an oil bath which insures quiet operation of the push rods. The oil capacity is 1½ gallons, and a large filler spout is used, which is mounted on top of the engine in a very accessible position. The oil base is ribbed to insure that the oil will be cooled as it is re-circulated to the bearings.



Rear view of the chassis, showing the torque tube support. Also, note the frame horn at the rear of the car which supports the spring shackle

The clutch is in unit with the other two parts of the power plant, the engine and the transmission. It is of the multiple dry plate type, and the transmission has three speeds forward. The angle of the propeller shaft is very slight. The universal joint at the junction of the



Front view of the H. C. S.

transmission and the torque tube is therefore not called on for any over strenuous work through power transmission at steep angles. The central drive type which is employed is constructed very rigidly and absorbs all the torque strains of braking and driving and also serves as a radius rod to take the driving thrust. The rear springs are therefore relieved of all duties except those of supplying the spring support.

The rear axle which is in unit with the torque tube is of the three-quarter floating type. Spiral bevel gears are used in the rear axle mounted on roller bearings. The axle shafts are splined and operate in large annular ball bearings at the wheel end of the shaft.

The front springs are 36 by 2½ in. and the rear 56 by 2½ in. Thin leafed springs are used, with a greater number of leaves to provide more spring flexibility. The equipment of the car includes two extra tires with wire wheels, silver reflector spotlight, motometer, horn, tools and a 75 m.p.h. speedometer operated from the transmission.

At present they are bringing through the first car, but will have more room for a production of five or ten cars daily. It is hoped to be in the first unit by July 1.

Portable Reboring Machine

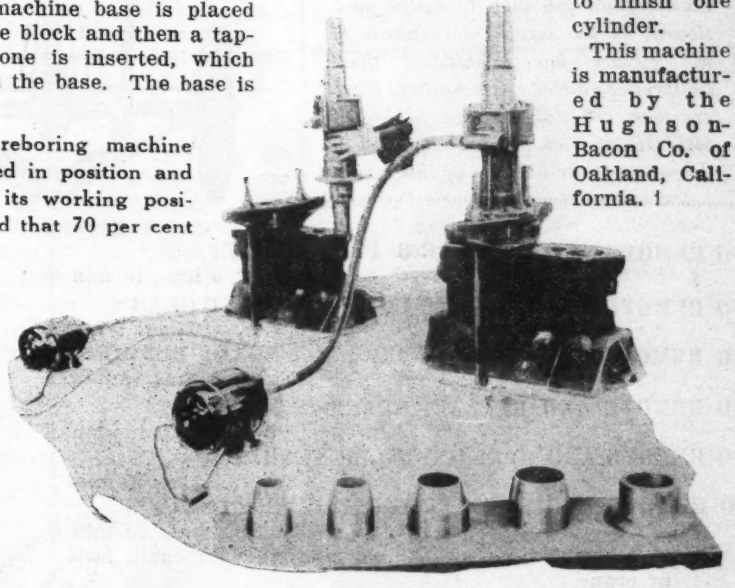
Does Not Require Skilled Mechanic to Operate, Power Furnished by 1-6 Hp. Electric Motor With Flexible Shaft

A PORTABLE reboring machine has recently been perfected that does not require a skilled mechanic to operate. Any mechanic that is capable of reading a micrometer can operate the reboring machine. It will rebore cylinders ranging from 2½ to 5½ in. in diameter set by micrometer on any internal combustion engine.

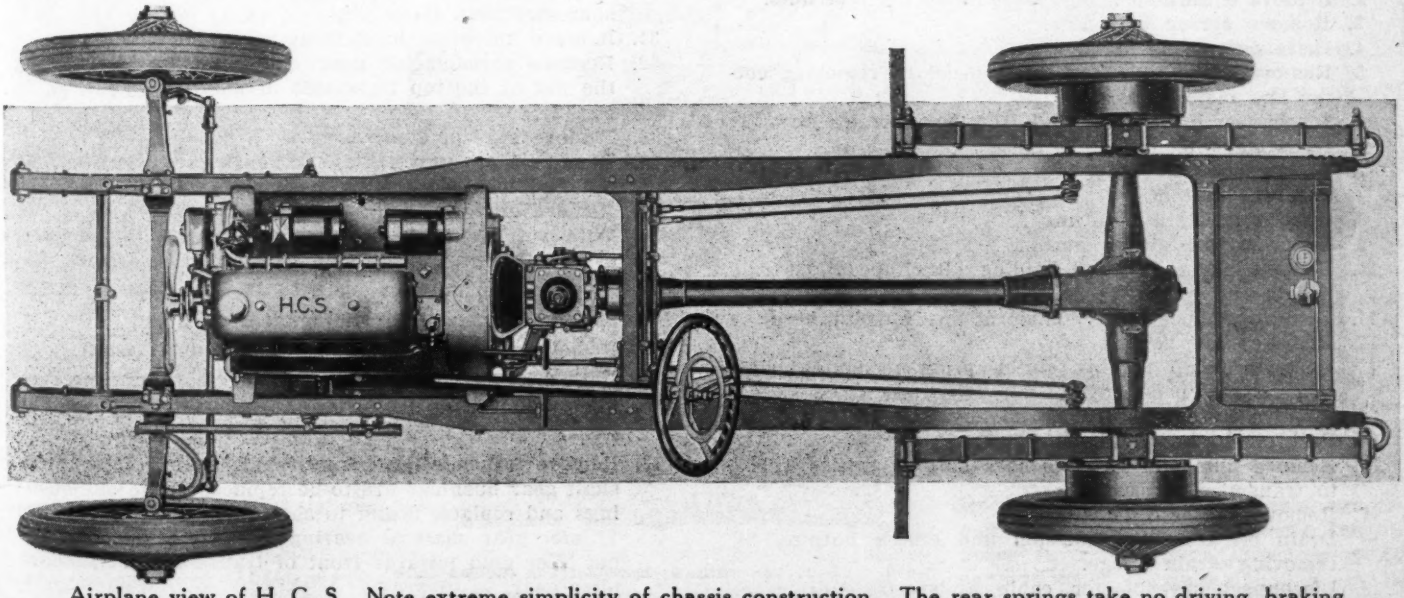
It is claimed that seventy percent of open head engines can be rebored, without removing the cylinder block. This save a day or a day and a half, because it usually requires this length of time to remove the block and to replace the same. All that is necessary is to remove the lower half of the crankcase, clean the head and push the piston out. Then the machine base is placed on the head of the block and then a tapered centering cone is inserted, which positively centers the base. The base is then clamped tightly to the block by two bolts. The boring machine is then placed in position on the wing base, and securely fastened by four bolts. The machine which carries the boring bar is connected with the wing base by male and female joint, which centers the bar with the wing base.

The machine is driven by a 1/6 hp. electric motor with flexible cable. It can be operated from the ordinary lighting circuit, and it is not necessary to bolt the motor down. It can be set on the work bench, or on the floor, or on the running board of the automobile, if the cylinder block is not removed from the car. It requires about 30 min: to set the boring machine in position and to finish one cylinder.

This machine is manufactured by the Hughson-Bacon Co. of Oakland, California.



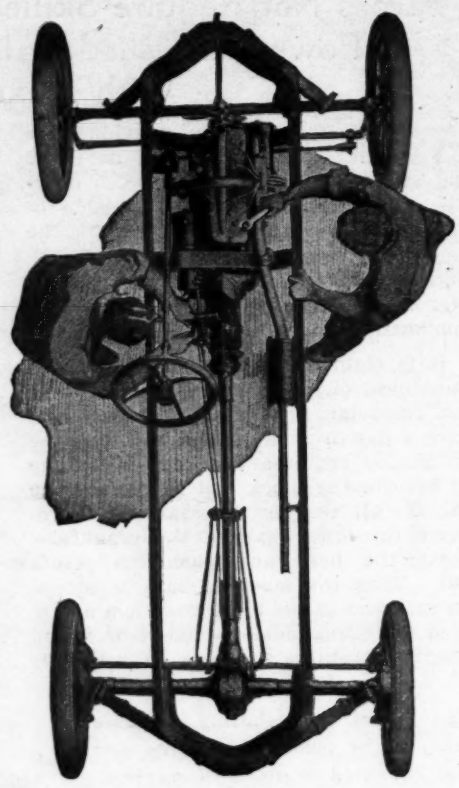
This shows the reboring machine ready to be placed in position and also mounted in its working position. It is claimed that 70 per cent of the open head engines can be rebored with this machine without removing the cylinder block. It requires about 30 m.in to set the boring machine and to finish one cylinder



Airplane view of H. C. S. Note extreme simplicity of chassis construction. The rear springs take no driving, braking or forward thrust, as the torque is provided for this

SERVICING THE OVERLAND FOUR

THIS is the twelfth of a series of articles dealing with the service operations on the Overland Four. The work as it stands has been prepared by the Willys-Overland Co. and the dealer will find at the head of each operation the amount of time required to do the job. The operations have been put down in a step-by-step method so that one operation is logically followed by the next. This makes it possible for the service man to have on hand all the necessary tools and equipment before beginning the job. Incidentally, the time limit set for the job affords a ready means whereby the skill of the mechanic can be judged. Other things being equal it should not take a man longer to do a certain job than herewith mentioned, as the service department of the factory has established these limits after much experimenting. Dealers who are not keeping copies of MOTOR AGE on file are suggested to do so to get the benefits of this series.



PART XII—The Engine

THESE valuable articles—Servicing the Overland Four—will run serially each week until the service operations on the entire car have been explained. This week deals with the

Engine

Next week will be a continuation of the service operations on the engine.

Keep a file of MOTOR AGE for ready reference. The flat-rate system of estimating on a job has been proved the best plan to make your service work more profitable, eliminate complaints and please your customers. The time given here for each service operation can be adapted to the flat-rate system of estimating cost of repair jobs on cars of this class.

TO REMOVE AND REPLACE COUNTER SHAFT
Time: 3 hrs., 15 min.

TO REMOVE AND REPLACE COUNTER SHAFT GEAR
Time: 3 hrs.

TO REMOVE AND REPLACE COUNTER SHAFT BUSHINGS
Time: 3 hrs., 15 min.

TO REMOVE AND REPLACE IDLER GEAR SHAFT
Time: 3 hrs., 15 min.

TO REMOVE AND REPLACE IDLER GEAR
Time: 3 hrs., 15 min.

TO REMOVE AND REPLACE IDLER GEAR BUSHINGS
Time: 3 hrs., 20 min.

1. Take weight of car off rear springs with chain falls or crane.
2. Remove cotterpins from rear axle spring bolt nuts.
3. Remove spring bolt nuts.
4. Drive out spring bolts.
5. Remove brake rod from brake pedal by removing cotter and clevis pins.
6. Disconnect hand brake rod from hand brake lever by removing wing adjusting nut.
7. With proper blocking, block up torsion tube and roll out rear system.
8. Unhook accelerator spring .
9. Unscrew accelerator button.
10. Remove clamping bolts holding clutch pedal pads to pedals and remove pedal pad.
11. Disconnect speedometer cable at speedometer head.
12. Remove floor boards.
13. Remove clamp holding clutch pedal to clutch shaft and remove pedal.
14. Remove clutch shaft Woodruff key.
15. Pull off brake pedal.
16. Remove nuts and lock washers holding gearshift box to transmission case.
17. Remove gearshift housing.
18. Drain oil from transmission and clutch housing by removing drain plugs.
19. Disconnect speedometer cable at speedometer drive shaft end.
20. Block up under transmission.
21. Remove all cap screws holding transmission case to engine base.
22. Remove transmission assembly.
23. Screw in one starting motor cap screw to hold starting motor in position.
24. Remove four cap screws holding universal ball joint retainer to universal joint housing.
25. Remove universal ball joint retainer.
26. Remove locking wire from the four cap screws holding universal joint rings together.
27. Remove universal joint cap screws.
28. Remove universal joint rear ring and yoke.
29. Remove cotterpin from transmission main shaft nut.
30. Place transmission in low gear and remove transmission shaft nut.
31. Remove universal joint front yoke and ring.
32. Remove speedometer gear and shaft by unscrewing the nut at the top right side of universal joint, as in Fig. 24.
33. Remove speedometer worm.
34. Remove three universal joint housing cap screws, one nut and lock washer.
35. Remove universal joint housing.
36. With soft drift-punch tapping lightly with hammer, drive out rear transmission bearing. See Fig. 23.
37. Remove transmission shaft.
38. Remove transmission sliding gears.
39. Remove cotterpin in case holding counter shaft.
40. With drift-punch, drive out counter shaft towards rear of transmission case.
41. Remove shaft.
42. Remove transmission counter shaft gears. If countershaft gear bushings are to be replaced, drive out bushings and replace, fitting to shaft with bushing reamer. If idler gear shaft or bearing is to be replaced, drive out idler stud towards front of transmission. Remove idler gear.
If idler gear bushing is to be replaced, drive out bush-

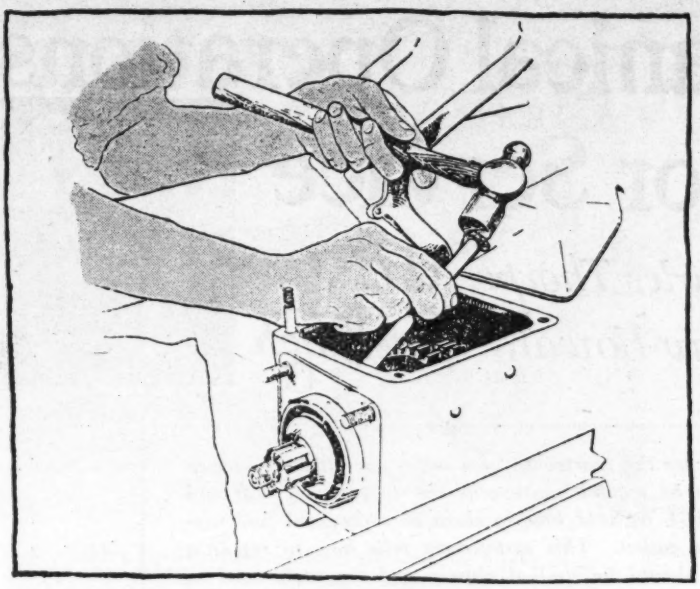


Fig 23—Driving out rear annular transmission bearing

ing and assemble new bushing in gear, fitting to idler shaft with bushing reamer.
Replace idler gear, driving idler shaft towards rear transmission case.

43. Assemble counter shaft gear and shaft.
44. Cotterpin shaft in transmission housing.
45. Put in transmission shaft, assembling sliding gears on shaft.
46. Install transmission rear bearing.
47. Assemble universal joint housing with three cap screws, one lock washer and nut.
48. Put on speedometer worm.
49. Assemble speedometer drive gear and shaft.
50. Put on universal joint front ring and yoke.
51. Put transmission in low gear.
52. Put on transmission nut. Tighten securely and cotterpin.
53. Replace transmission rear universal joint yoke and ring, clamping rings together with four cap screws.
54. Lock wire universal ring cap screws.
55. Install universal ball joint and retainer. Fasten to housing with four cap screws, lock washer under head.
56. Remove cap screw holding starter motor in place.
57. Assemble transmission on blocks unde rear and place in position.
58. Place clutch shift fork between clutch thrust bearing and clutch plate.
59. Put key in clutch shaft and install clutch pedal.
60. Pry clutch pedal forward, which will force transmission assembly in place.
61. Screw in all transmission cap screws holding transmission to engine base.
62. Remove clutch pedal and clutch shaft gear.
63. Install brake pedal.
64. Install clutch shaft key.
65. Install clutch pedal, locking to clutch shaft with clamp bolt.
66. Connect brake rod to brake pedal with clevis and cotterpin.
67. Place transmission gears in neutral.
68. Place gearshift lever in neutral.
69. Install gearshift housing. Be sure that gasket is between gearshift box and transmission case.
70. Fasten gearshift box to transmission case with lock washers and nuts. Tighten securely.
71. Roll rear system under car—one man under car steering propeller shaft into universal joint.
72. Lower rear of car so that left rear spring bolt can be installed.
73. Install right rear spring bolt.
74. Put on spring bolt nuts. Draw tightly and cotterpin.
75. Connect foot brake rod with foot brake pedal with clevis and cotterpins.
76. Connect hand brake rod to hand brake lever with wing adjusting nut.
77. Put in floor boards.
78. Connect speedometer cable to speedometer head .
79. Put in clutch pedal pads, clamping to pedals with clamp bolts, lock washers and nuts.
80. Connect accelerator spring.
81. Screw on accelerator button.
82. Fill engine base to proper level with oil.

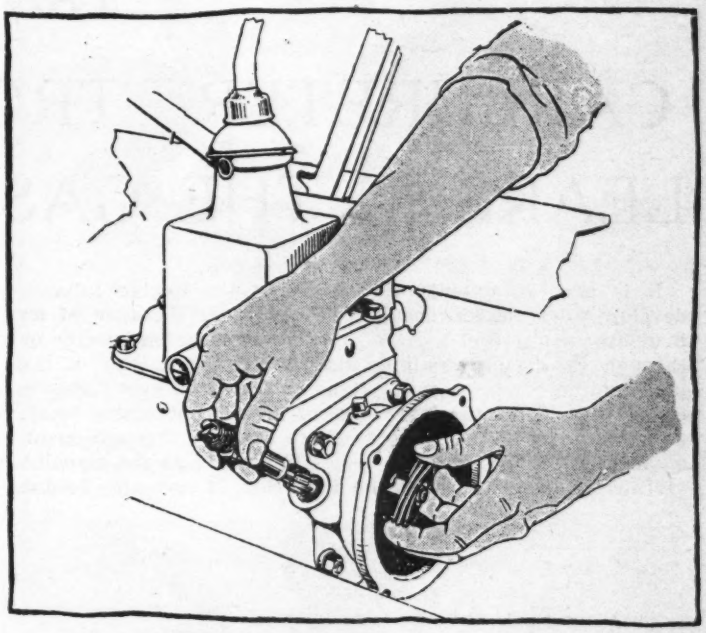


Fig 24—Removing speedometer drive shaft gear and worm

PRINCE FORMS SPEEDWAY CIRCUIT

Atlanta, Ga., May 3—Atlanta, Dallas, Jacksonville and Havana, Cuba, are to be the cities composing a new speedway circuit which is being planned by Jack Prince, president of the Prince Speedway Construction Co. of Los Angeles, who has been here in conference with members of the Atlanta Automobile Dealers' association. Mr. Prince announced here that the contract for a speedway in Havana already had been closed and that there seemed to be no obstacle to prevent the construction of similar speedways in Atlanta and Jacksonville.

According to Mr. Prince's announcement the speedway in Atlanta is practically assured, and when constructed will be a duplicate of the speedway recently opened in Los Angeles, costing approximately $250,000. The speedways here and in other cities would be build by Mr. Prince's firm and would form a Southern race circuit. Many dealers here have given their endorsement to the course as a valuable asset to the automobile industry in the South.

TRACTOR MEN ELECT OFFICERS

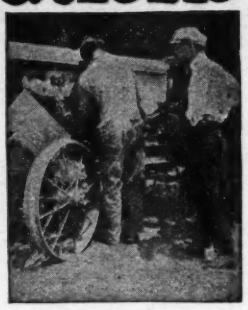
Kansas City, May 3—The Kansas City Tractor club elected the following officers April 26: President, G. T. O'Maley, Fordson; vice president, Fred H. Turner, B. F. Avery & Sons Plow Co.; secretary-treasurer, Guy H. Hall; directors—E. J. Anderson, Ralph Johnson, W. E. Manning, Robert Powers, Edwin Downs.

Mr. Hall will manage the tractor show next year, for which tentative plans are now being considered.

BEROTH TO INSTALL STOUGHTON SERVICE

Stoughton, Wis., April 30—Orin S. Beroth, formerly service manager of the Indiana Truck Corp., has been appointed director of the new service department being organized by the Stoughton Wagon Co. He will install an entirely new service system for the Stoughton company based on his experience of fifteen years in service work for passenger car and truck concerns.

Standard Mechanical Operations in Tractor Service



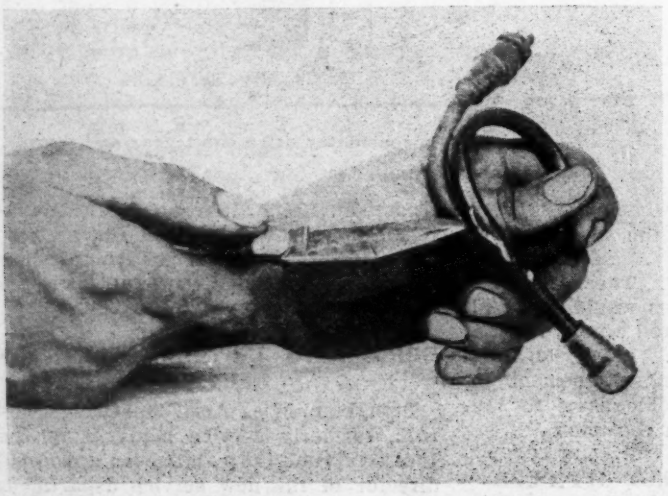
by John Charles Thorpe, M.E.
and Gustav Howard Radebaugh

EDITOR'S NOTE: The three pages herewith are the fourteenth of a series covering the service operations on tractors, although the same can be applied quite generally to passenger car and truck engines. In last week's issue of MOTOR AGE we told how to clean an obstructed fuel supply line and to repair a cracked carbureter flange gasket. This installment tells how to repair a leaky fuel supply pipe by soldering. The views should be studied closely and the tools used as shown. The operations are depicted in the approved manner and should be followed to secure the best results.

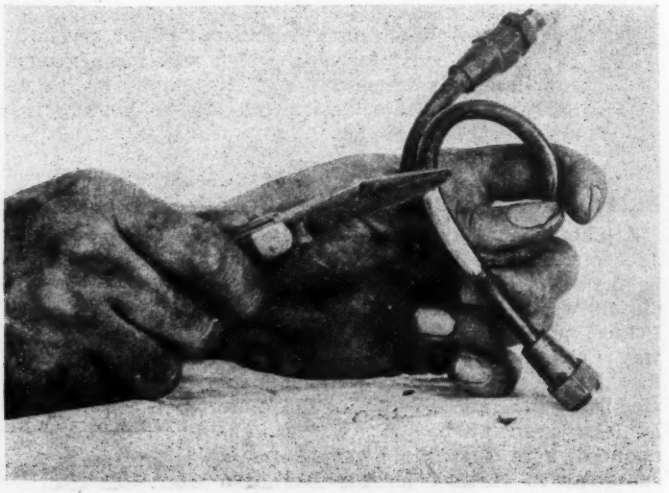
PART XIV

CARBURETER TROUBLES—REPAIRING LEAKS IN THE GASOLINE SUPPLY LINE

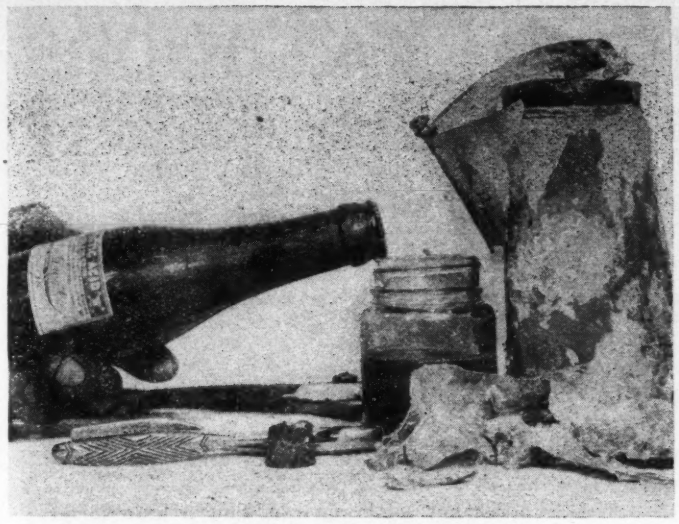
It is not infrequently the case that the engine fails to develop power under heavy load conditions, because of an inadequate supply of gasoline flowing into the carbureter or through the gasoline supply line caused by a leak in the pipe running from the supply tank to the carbureter. This is caused usually by the fastenings of the pipe becoming loose, and thus allowing the pipe to chafe and rub through on an adjacent part with which it comes in contact as the machine vibrates in its motion crossing the field. It may also be due to the careless handling of tools or heavy parts that are dropped on the pipe. The present operation will have to do with the operation of soldering such a leak. It is presumed that the operator will have the necessary equipment, including blow torch, soldering iron, solder and flux at hand. Generally speaking, there are two standard operations in soldering practice, one involving the use of a piece of patching material, and the other the closing of the leak without such patching material with solder alone.



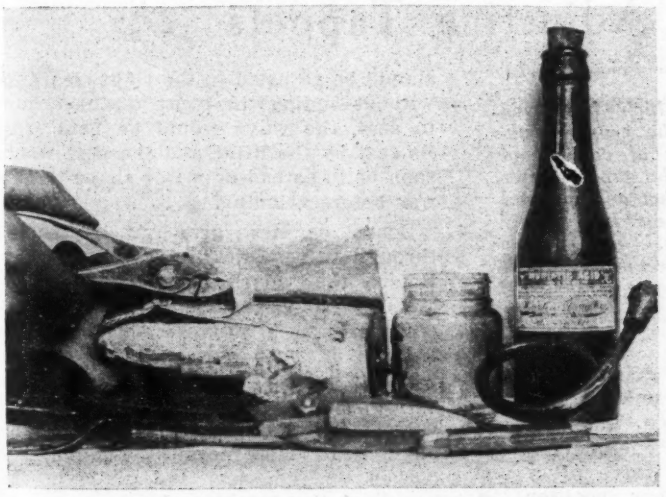
1—Cleanliness is of the first importance in all soldering operations. The space around the leak may be cleaned by scraping with a heavy pocket knife, by filing or by the use of sand paper or emery cloth. It is important that this process be thoroughly done, in order that the solder may hold to the pipe



2—It will be noted in this view that while the hole in the pipe is comparatively small, a considerable area of surface of the pipe must be cleaned thoroughly in order to provide sufficient surface for the solder. The mere cleaning of the surface immediately surrounding the hole or crack in the pipe is not sufficient.

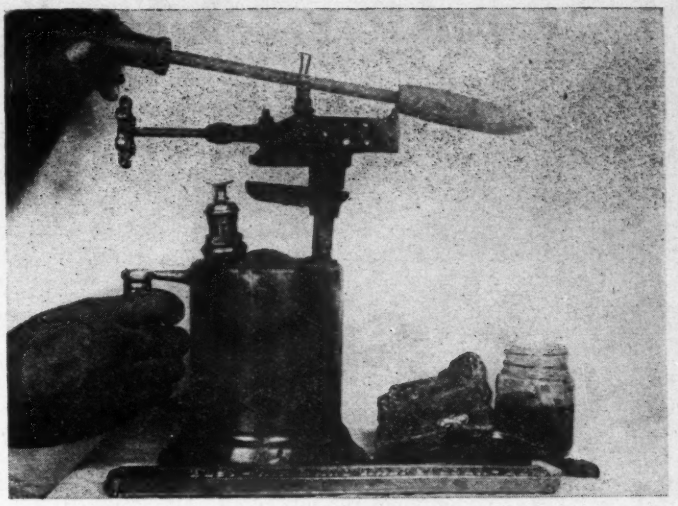


3—Soldering fluids are generally known as fluxes. For soft soldering the most common fluxes used are rosin, salammoniac, and muriatic of zinc. Zinc solution can be made by placing some muriatic acid in a glass jar, in the open air, and dropping into it zinc, taken from a discarded dry cell battery

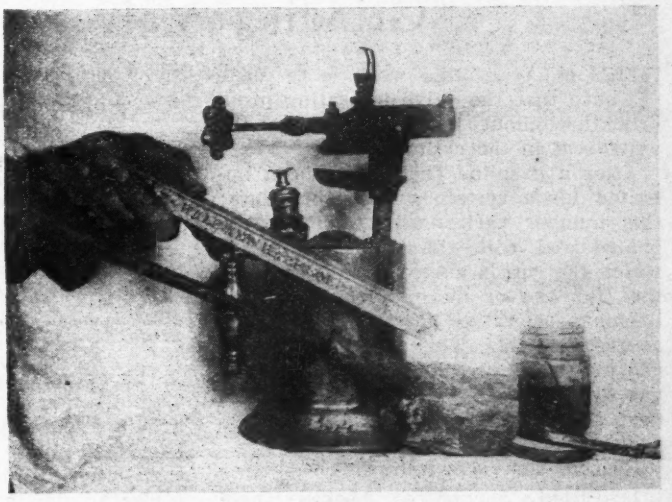


4—The zinc should be cut into small pieces to facili tate the rapid action of the muriatic acid in forming the solution

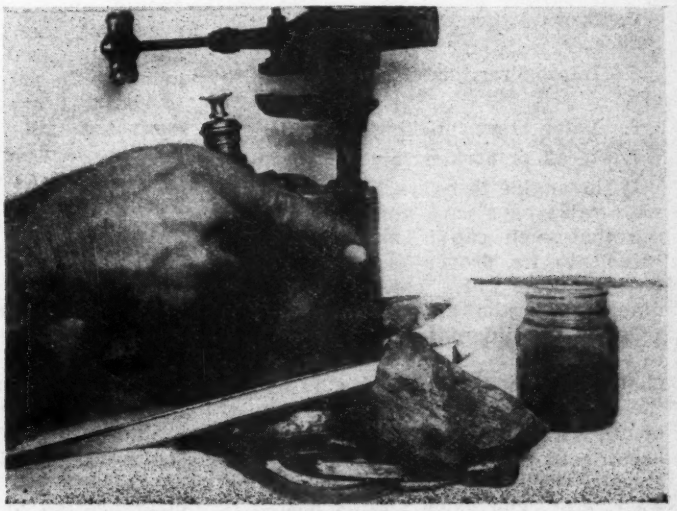
5—The small pieces of zinc should be added to the acid slowly at first, as the action is rather violent, giving the appearance of rapid boiling. As this action subsides, add more pieces until no more bubbles arise from the solution. For ordinary use the solution may be diluted with an equal amount of water



6—The gasoline blow torch affords a convenience for heating the soldering iron, although it may be done in a forge fire. Care should be taken in this process to see that the heating does not pass beyond a dull red color. If the iron passes beyond this heat it is necessary to re-tin it

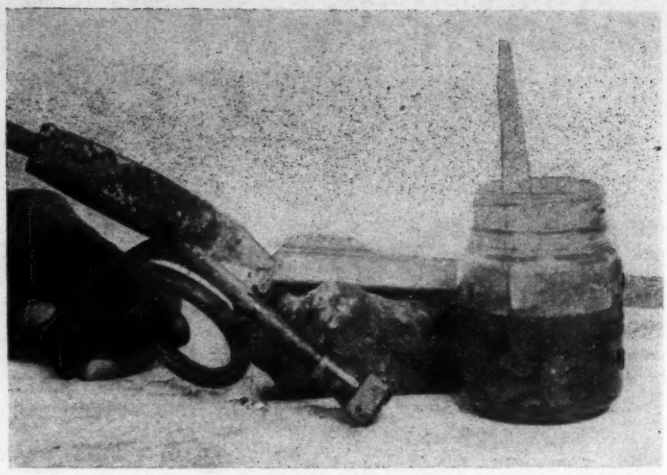


7—Further precaution should be taken in cleaning by rubbing the tip of the hot iron on a stone or piece of salammoniac. After the iron is cleaned, it is tinned



8—A simple scheme for tinning the iron is to take a can lid with a depression in it, in which a small piece of solder and some of the soldering solution is placed. If the clean hot iron is placed in contact with the solder in the fluid, the tip of the iron will be tinned as above

9—The space around the hole or the crack must always be tinned. This is done by first covering the surface with the flux, or in lieu of this preparation, the soldering paste which can be purchased from any hardware store is sometimes used. It is of some advantage to sprinkle a little powdered rosin over the flux on the space to be tinned



10—With the hot soldering iron, flow a little solder over the surface of the crack. This process must be continued until a smooth layer of solder adheres to the surface around the crack or hole, and with the appearance of a slightly increased thickness over the crack or hole. Care should be exercised to see that the solder flows smoothly and evenly on the surface

Grinding Valves and Adjusting Tappets

THE object of this work is to make sure that the valve is seating properly throughout its surface upon the valve seat in the cylinder.

After a gasoline engine has been operated for a certain number of hours; this number varies with each type of engine and with the conditions under which the run is made; it will be found that for one or more of the following reasons the valves are failing to seat as they should. This allows the fresh gas under compression and the working gas during the power stroke, to escape past the valve seat, thus lowering the power which the engine develops.

Reasons for valve failure:

1. Pitted, burned or broken valve heads or seats.
2. Warped valve heads.
3. Bent valve stems.
4. Worn valve stems or valve stem guides.
5. Improper adjustment of valve lifters.
6. Valve stems sticking in guides.
7. Weak or broken valve springs.

If the engine to be worked on is fitted with valve caps care must be taken to see that each cap is marked and returned to its proper place. On some engines these valve caps are made in different lengths and the compression space in the different cylinders adjusted to an equal size in this way. Thus any change of position made in returning the valve caps would effect this adjustment. After the valves and springs have been removed all parts should be cleaned. The valve stems tested for wear, etc. The valve springs tested to see that they retain their proper strength. The valve lifters must have an even surface square with the lower end of the valve stem. If this surface is worn it must be ground true. Use lathe and center grinder for this work.

Editor's Note: Much has been written concerning the proper methods in the grinding of valves and the adjustment of the tappets after grinding. Here is what an old hand at the repair business has to say about grinding valves. There are few things mentioned here that are worth while reading about.

The actual work of grinding is very simple. Use a very small amount of grinding compound, put the valve in place and rotate about one-quarter turn each way, lifting the valve often and replacing it in another position. A light spring placed under the head of the valve will make this change of position very easy to accomplish. Valves should be ground until a clean, even seat, free from pits, on both valve and valve seat has been made. In grinding the valves care should be taken to see that none of the valve grinding compound gets into the cylinder. If gasoline is used to wash out the compound great care must be used as the gasoline spreads the compound and will carry it down into the valve stem guide as well as into the cylinder.

After the valves have been ground and replaced the valve lifters must be adjusted. These adjustments must be accurately made and care must be used to see that the valve cam is not holding up the valve lifter. After the engine has been run 10 or 15 min. and while it is still hot these adjustments should be rechecked to see that there is enough clearance left to allow the valve to seat as it should. In any case where it is found that the distance between the valve and the lifter has become greater the cause must be sought. It is more than probable that the valve is again not seating properly. If the valve lifter should be adjusted to the right clearance without finding the cause of the failure to seat, the valve would be held from its seat by the lifter and the seat would soon be in as bad or worse shape than it was before grinding.

Some engines give much trouble through valves sticking in their guides. Before the valves are taken out for grinding they should be carefully inspected to see if any are sticking. This trouble is most noticeable in engines with valves of large size. The proper way to cure this trouble is to clean the valve stem and valve stem guide thoroughly. It will generally be found that carbon on the stem and guide is the cause of the trouble. If the guide is so tight that the heat of the engine causes the valve to stick it should be reamed out with the proper size adjustable reamer. Do not reduce the size of the valve stem under the standard as it will wear out soon enough. The valve head gets rid of its heat through the stem and making it smaller even to a slight degree will cause the valve to run hotter and burn quicker. For this same reason care must be taken not to enlarge the valve guide more than necessary to give a free moving valve. The heat path from the valve stem to the guide is poor enough with the best possible fit.

If the valve seat in the cylinder is badly burned or pitted the best means of renewing the seat is to use one of the many cylinder valve seat refacing tools made for this purpose. In using one of these tools care should be used to see that none of the chips from the seat are allowed to find their way into the cylinder. It is also well to hold the cutting tool firmly so that it will not chatter and leave an uneven seat. Remove just as little metal from the seat as will allow all pits and burned spots to be cleaned up.

Where Parts Can Be Obtained for Orphan Passenger Cars and Trucks

Motor Age Maintenance Data Sheet No. 95

One of a series of weekly pages of information valuable to service men and dealers—save this page

Imperial
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Erbes, L. C., 2654 W. University Ave., St. Paul.
Imperial Auto Part Co., Detroit.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
Standard Motor Parts Co., New Castle, Ind
The Boneyard, Washington, Ia.

Inter-State
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
Standard Motor Parts Co., New Castle, Ind
Wolf Auto Parts & Tire Co., 619 N. Illinois St., Indianapolis.

Jeffery
Auto Parts Co., 4116-18 Olive St., St. Louis.
Auto Salvage Co., Tulsa, Okla.
Nash Motors Co., Kenosha, Wis.

Jenkins
Dayton Auto Parts Co., 1777 Broadway, New York.
Puritan Machine Co., 409 Lafayette blvd., Detroit.

Keeton
Car-Nation Motor Car Co., Detroit.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Standard Motor Parts Co., New Castle, Ind.

Krit
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Auto Parts Co., 4116-18 Olive St., St. Louis.
Auto Salvage Co., 1701-03 Main St., Kansas City.
Connecticut Auto Parts Co., 583 Franklin Ave., Hartford, Conn.
Krit Motor Car Co., Detroit.
Motor Corp., 1309 Race St., Philadelphia.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
Service Gear & Machine Co., Reading, Pa.
Schober, G. M., 3339 Market St., Philadelphia.
Standard Motor Parts Co., New Castle, Ind.
Wolf Auto Parts & Tire Co., 619 N. Illinois St., Indianapolis.
Wycoff Auto Salvage Co., Sioux City, Ia.
The Boneyard, Washington, Ia.

Knox
Alco Service Co., 158 N. 22nd St., Philadelphia.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Boulevard Motor Co., 276 River St., Cambridge, Mass.
Knox Motors' Association, Springfield, Mass.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
Wolf Auto Parts & Tire Co., 619 N. Illinois St., Indianapolis.
Wycoff Auto Salvage Co., Sioux City, Ia.

Lambert
Great Western Auto Co., Kalamazoo, Mich.
Lambert Auto Service Co., 430 N. Capitol Ave., Indianapolis.
Wichita Auto Wrecking Co., 801 W. Douglas Ave., Wichita.

Laurel
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.

Lewis
Longaker Co., V. A., 448 N. Capitol Ave., Indianapolis.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Lion
Gorey & Co., Jos. C., 354 W. 50th St., New York.
Levene Motor Co., 2200-08 Diamond St., Philadelphia.
Lion Motor Parts Co., Philadelphia.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Lippard
Standard Motor Parts Co., Detroit.

Little
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.
Auto Salvage, Tulsa, Okla.
Chevrolet Motor Co., 1764 Broadway, New York.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Wichita Auto Wrecking Co., 801 W. Douglas Ave., Wichita.
Wolf Auto Parts & Tire Co., 619 N. Illinois St., Indianapolis.

Lozier
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Gorey & Co., Jos. C., 354 W. 50th St., New York.
Lozier Motor Car Co., Fort and Sixth Sts., Detroit.
Philadelphia Machine Works, Philadelphia.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Standard Motor Parts Co., New Castle, Ind.
Wolf Auto Parts & Tire Co., 619 N. Illinois St., Indianapolis.

Lyons-Knight
Service Gear & Machine Co., Reading, Pa.
Wolf Auto Parts & Tire Co., 619 N. Illinois St., Indianapolis.

McIntyre
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Marathon
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Marathon Service Co., Nashville, Tenn.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Service Gear & Machine Co., Reading, Pa.
Wichita Auto Wrecking Co., 801 W. Douglas Ave., Wichita.
Wolf Auto Parts & Tire Co., 619 N. Illinois St., Indianapolis.

Marion
American Motors Parts Co., 430 N. Capitol Ave., Indianapolis.
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.
Automobile Mechanics Corp., 159-61 W. 24th St., New York.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Auto Parts Co., 4116 Olive St., St. Louis.
Connecticut Auto Parts Co., 583 Franklin Ave., Hartford, Conn.
Dayton Auto Parts Co., 1777 Broadway, New York.
Elyria Belting & Machinery Co., Elyria, O.
Gorey & Co., Jos. C., 354 W. 50th St., New York.
Longaker Co., V. A., 448-50 N. Capitol Ave., Indianapolis.
Marion Motor Co., 2450 Michigan Ave., Chicago.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Sattler's Machine Shops & Works, 1601 Spring Garden St., Philadelphia.
Wolf Auto Parts & Tire Co., I., 619 N. Illinois St., Indianapolis.

Marion Handley
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Auto Salvage & Exchange Co., 1317 Locust St., Des Moines.
Dayton Auto Parts Co., 1777 Broadway, New York.
Gorey & Co., Jos. C., 354 W. 50th St., New York.

Mason
Auto Salvage & Exchange Co., 1317-19 Locust St., Des Moines.
Erbes, L. C., 2654 W. University Ave., St. Paul.
Longaker Co., V. A., 448-50 Capitol Ave., Indianapolis.
Mason Motor Car Co., Detroit.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Standard Motor Parts Co., New Castle, Ind.
Wichita Auto Wrecking Co., 801 W. Douglas Ave., Wichita.

Matheson
Boulevard Motor Co., 276 River St., Cambridge, Mass.
Matheson Co., Frank F., 694 Wyoming Ave., Wilkes-Barre, Pa.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Service Gear & Machine Co., Reading, Pa.
Wolf Auto Parts & Tire Co., 619 N. Illinois St., Indianapolis.

Maytag
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Wichita Auto Wrecking Co., 1801 W. Douglas Ave., Wichita.

Mercedes
Connecticut Auto Parts Co., 583 Franklin Ave., Hartford, Conn.

Michigan
Auto Gear Co., 1404 Hennepin Ave., Minneapolis.
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Buda Co., Harvey, Ill.
Burt Motor Car Co., W. J., Pico and Hope Sts., Los Angeles.
Davis, Carey A., 486 Louisiana Ave., Washington, D. C.
Gorey & Co., Jos. C., 354 W. 50th St., New York.
Michigan Motor Parts Co., Detroit.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Service Gear & Machine Co., Reading, Pa.
Standard Motor Parts Co., New Castle, Ind.
Philadelphia Machine Works, 67 Laurel St., Philadelphia.
Wichita Auto Wrecking Co., Wichita.
Wycoff Auto Salvage Co., Sioux City, Ia.

Midland
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Levene Motor Co., 2200-18 Diamond St., Philadelphia.
Midland Motor Co., Philadelphia.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Meteor
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.
Meteor Car Co., Piqua, O.

Morn
Philadelphia Machine Works, 61-71 Laurel St., Philadelphia.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Northern
Puritan Machine Co., 409 Lafayette Blvd., Detroit.

Nyberg
Auto Gear Co., 844 Eighth Ave., New York.
Auto Gear & Parts Co., 291-93 Marietta Ave., Atlanta.
Auto Parts Co., 2801-11 Preston Ave., Houston, Tex.
Auto Salvage & Exchange Co., 1317-19 W. Locust St., Des Moines.
Longaker Co., V. A., 448 N. Capitol Ave., Indianapolis.
Puritan Machine Co., 409 Lafayette Blvd., Detroit.
Wolf Auto Parts & Tire Co., I., 619 N. Illinois St., Indianapolis.

Garage Planning
Service Station Arrangements

No. 218

DODGE SALES AND SERVICE STATION

We are thinking of building on an inside lot 75 ft. frontage on main street, and 160 ft. deep. Have Dodge sales and service for Wayne county. A county of about 50,000. Richmond is a city of about 30,000. We are on the Old National Road from Columbus to Indianapolis. Thought we would build large enough for future needs catering to car storage and some general repairs until our Dodge business was large enough to occupy all of building.

Believe we would put shop upstairs, having a two-story building. Think elevator perhaps cheaper than a ramp considering space, etc. We have burning-in-stand, engine test block, engine stand and axle stand, press in our shop. We will add drill press and perhaps a lathe. We also have a solid tire press. We have a good accessory department at present and we will want to have a good store for accessories. Do not have any battery department at present and are not sure we will add this line. Adjoining building on either side are residences.—Bethard Auto Agency, Richmond, Ind.

There is considerable more office and show room space in the layout than would be necessary for a general garage but when your Dodge business grows to the proportion you think it is going to and you are handling sales and service only you will need all you have and no alterations will be necessary.

In order to get all the space possible for storage on the main floor, so that customers will not be obliged to use the elevators any more than necessary we have moved the accessory and parts stock to the second floor; here with a stockkeeper in charge it can be kept up and in good order, parts are delivered direct to the shop on requisition and accessories and parts sent to the main floor sales room by a dumbwaiter, either electrically or hand operated.

We have shown no windows in the sides of the building as it is not customary to build windows into a wall that is right up to the lot line.

It might be well to set the building back to the general building line if it is not too far in order to preserve the residential aspect of the neighborhood. We have not taken this into consideration, however, as it would mean quite a sacrifice of space; perhaps your architect can secure the same result by this treatment of the exterior in such a way that it is in harmony with the surroundings.

CONDUCTED BY TOM WILDER

MOTOR AGE is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and readers are urged in asking for such plans to be used to include the following information:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

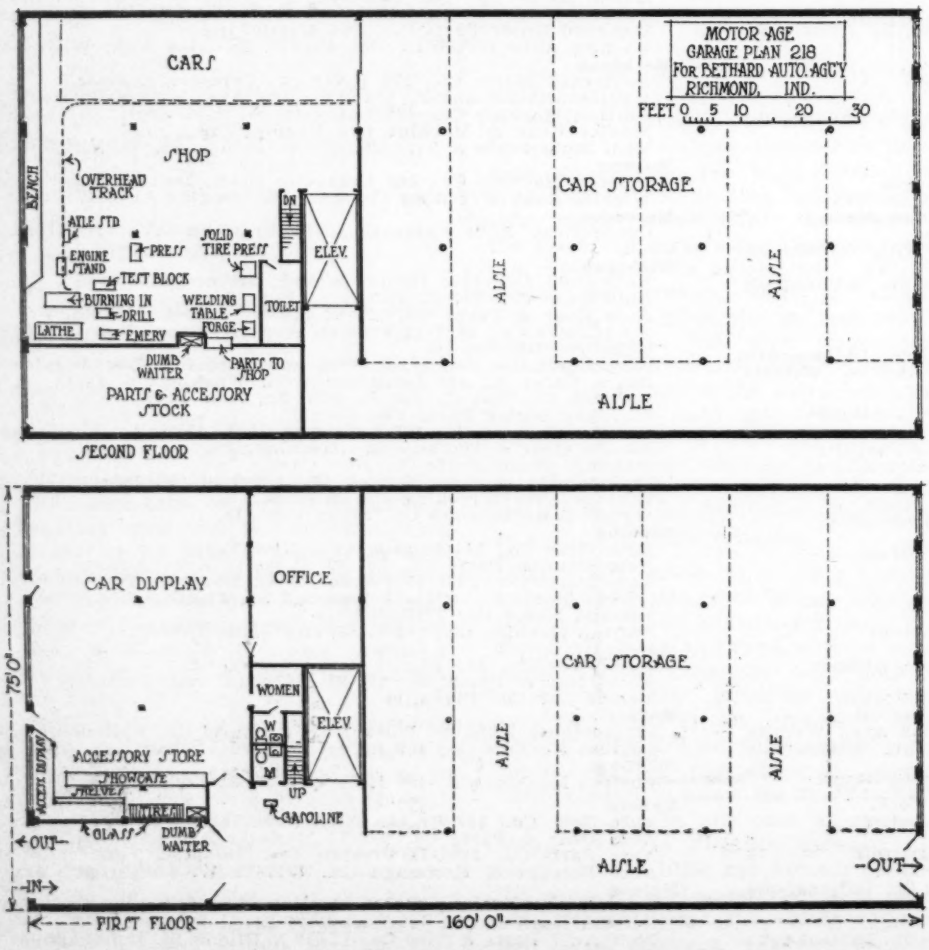
What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.



No. 218. Dodge sales and service station

No. 219

BASEMENT FOR STORAGE AND WORKSHOP

I will be very pleased if you can give me some assistance in planning a garage for a town of about 15,000.

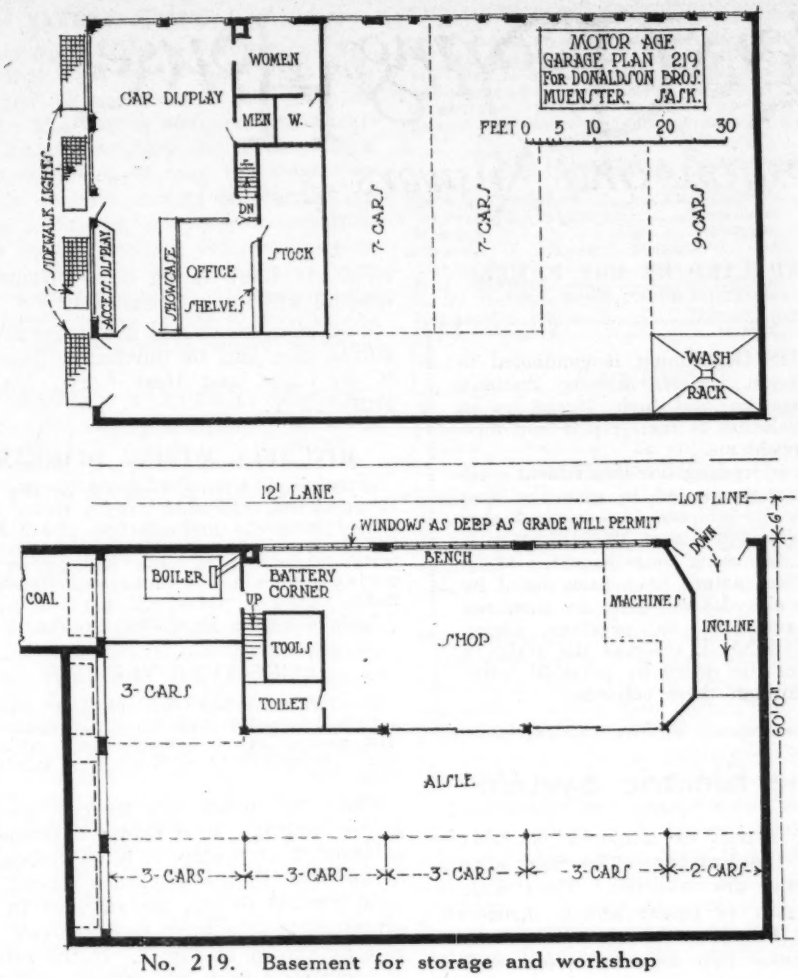
The lot has an 8 ft. drop from the front to rear and is 66 ft. wide and 100 ft. deep with a 6 ft. lane and I will leave 6 ft., which will give 12 ft. for a driveway to back of buiding.

The basement will be for car storage heating plant and workshop. The workshop to be equipped with drill press, lathe, emery burning in stand, battery room, tool room. This shop to face lane on west side of building; also show car hoist from basement heating plant at front end; also coal bin. The first floor to have display room for two cars, office restroom, store or stockroom, with accessory display room to be run by office help.

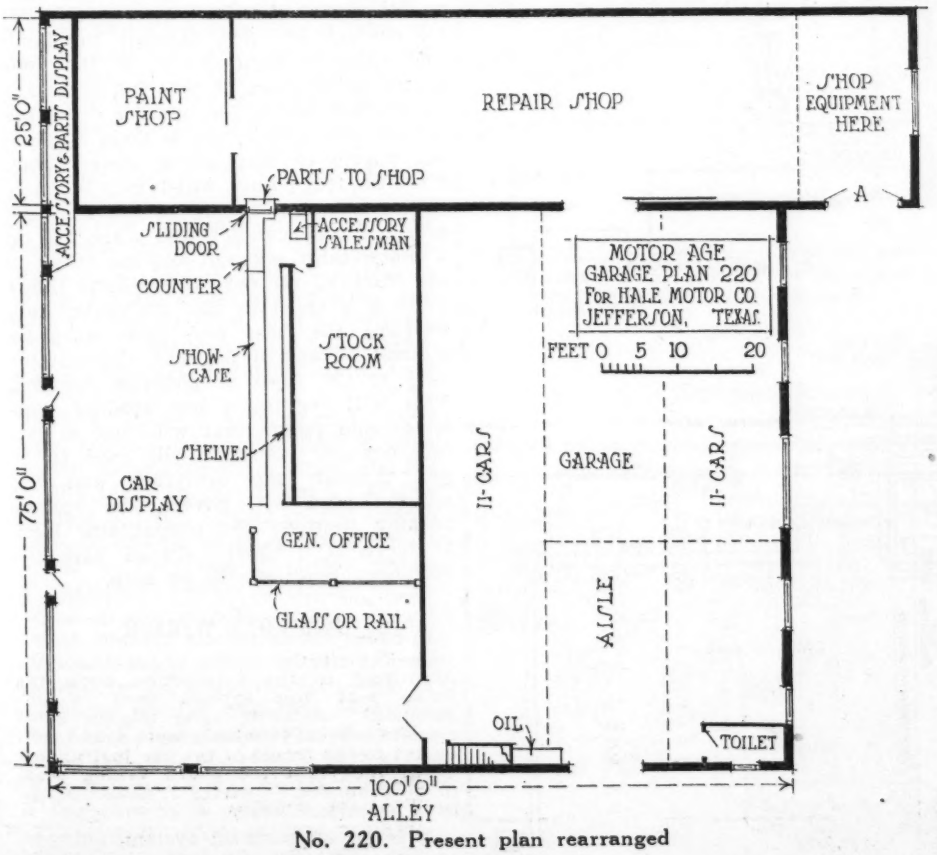
Workshop staff foreman, three mechanics, one electrician, three helpers. How many cars can be stored on first floor in rear.—Donaldson Bros. Garage, Muenster, Sask., Can.

You will need more drop than the 8 ft. that the lane affords in order to enter the basement, and it can be obtained by continuing the incline in the passage across the end of the shop, as we have shown. Provision should be made to prevent storm water which will run down the lane from entering the incline.

As a general rule, a basement is not the most desirable place for a workshop, but in this case, if the drop in grade of



No. 219. Basement for storage and workshop



No. 220. Present plan rearranged

the line is far enough front to allow side windows of reasonable size, you should get pretty good light. There is nothing that takes the place of a skylight, however, to make work easy and agreeable, and you may have trouble getting good mechanics to stay with you, as basement work is inclined to be depressing.

If new cars are stored in the basement a number can be placed in the aisle beside those indicated facing the aisle. On the upper floor the proportions do not permit a very economical arrangement, unless the one we show is used. If you have a number of cars in dead storage to fill the back aisle, or if you have customers who do not use their cars except through the middle of the day, you can manage very nicely.

No. 220

PRESENT PLAN REARRANGED

We are enclosing a rough sketch of our present garage arrangements. We desire to secure your advice in reference to a salesroom for 6 or 8 new cars, which to include our office and accessory room, arranged in such a manner where workmen and customers wanting parts and accessories would have to get them through the man in office, also arranged where this department could be locked up without closing repair shop.

We have a good building and a large volume of business, and would like the most advantageous arrangements. — Hale Motor Co., Jefferson, Texas.

The greatest criticism of your present plan is that there seems to be no arrangement or system to it. Your business has evidently grown up from a small repair shop and while it is way past the stage where departmentization should have been done the departments are still jumbled together in a hopeless mass.

We have in mind a small factory in Michigan which found itself in this state. The company was in despair and while they had more business than they could possibly handle they decided to close down completely for a month. They removed every machine and line shaft in the plant and rearranged them according to an entirely new progressive system, taking in raw material and parts at one end of the plant and delivering the finished product at the other. The result was that without increasing their force they were enabled to more than double their output and had considerable space left over for expansion.

We are not sure of your proportion as you failed to give the depth of your building or the position of the posts. The first thing to do is to close up about seven doors more or less, there is no necessity of being able to go through doors in any direction whatever. If traffic is kept to a few channels much confusion is prevented.

Since the storage room is really too narrow for advantageous storage it would be better to use it for a repair shop.

The accessory and parts stock is arranged so that the accessory salesman can take care of shop orders through the window or door provided this can be locked at night with the rest of the show room and shut off entirely from the shop.

A space 50 ft. deep reserved for the garage section will give storage to 22 cars without any congestion and with a free aisle into the shop.

The Readers' Clearing House

Questions and Answers

CONDUCTED BY ROY E. BERG
Technical Editor, Motor Age

THIS Department is conducted to assist Dealers, Service Stations, Garagemen and their Mechanics in the solution of their repair and service problems.

In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been asked by some one else and these are answered by reference to previous issues. MOTOR AGE reserves the right to answer the query by personal letter or through these columns.

TESTING STARTING MOTORS

Q—Publish wiring diagram of the 1913 Overland 71; this car had the U. S. L. starter built in the motor.

2—Is it a 12 or 24-volt current?

3—How can one determine whether or not starter is burned out?

4—If burned out, how can it be renewed?—Edwin Swisher, Robert H. Hassler, Inc., Indianapolis.

1—Wiring diagram of the Overland 69, 1913, appeared in the Feb. 19 issue of MOTOR AGE. This diagram is the same as that used on the model 71.

2—A 24-volt storage battery is used.

3—If after examining all of the connections, cleaning the commutator, testing the battery and looking over the brushes, the starting motor fails to work, you will have to make a complete test of the starting motor itself. First test for an open circuit (broken wire) or loose connection in the wire from starting switch to battery, from switch to starting motor, from motor to ground, from ground to battery. If the starting motor does not rotate at all it is probably a case of a weak battery, poor contacts or loose connections. A grounded armature coil will cause excessive current to be drawn from the storage battery while cranking, or will prevent cranking entirely. To test for this refer to Fig. 2. Place one of the test points on the frame or the armature shaft, both of which are grounded and the other point on the commutator. If the lamp lights it indicates a ground. Be sure to raise the brushes off the commutator and insulate them from the commutator with pieces of cardboard. To test for an open-circuited coil, connect the brushes of the motor to the terminal of a dry cell as shown in Fig. 3, so that a current of about 10 amperes is flowing through the brushes. The field should be entirely disconnected. Then with a special pair of points and a three-volt scale of the voltmeter measure the voltage across two adjacent commutator bars. If there is an open circuit the reading will increase materially.

4—If it is found that new parts are required they can be purchased from the U. S. Light and Heat Corp., Niagara Falls, N. Y.

The Electric System

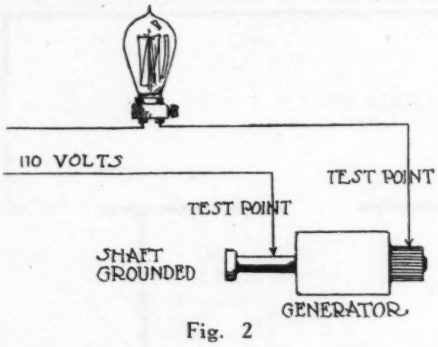


Fig. 2

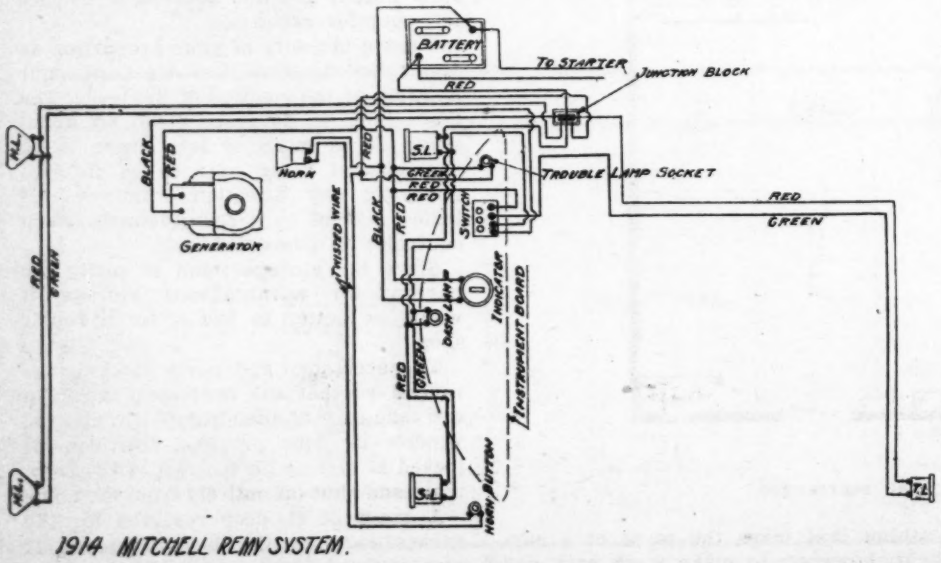


Fig. 1

MITCHELL WIRING DIAGRAM

Q—Publish wiring diagram of the 1914 Mitchell Six, equipped with a Remy generator magneto and starter. As I have the junction box unwired, am particularly interested in this portion of the wiring.—Mervin Barackman, Dewesse, Nebr.

This diagram is shown in Fig. 1.

ARMATURE TESTING

Q—Give method of testing out a 6-volt generator armature for open circuit and a short between two coils on the commutator. — Reader, Beatrice, Neb.

Close the cutout and observe the ammeter reading. If it shows a discharge of about 2 or 3 amp. it is an indication of an open in the armature circuit. A good method to test for an open in the armature is to a lamp in a 110 volt circuit as shown in Fig. 2. If the circuit is completely open no current will flow to the lamp, but if there is a short a little current will flow through the lamp and make it burn dimly. If the generator is in place it will be necessary to insulate all of the brushes from the commutator which may be done by placing sheets of wax paper under them. Take the test points, which may be made in any manner so long as you are able to get a good contact, and place one on a cummutator segment and the other on the frame of the car. If the lamp lights there is a short in that particular coil. Perhaps the best and most accurate method of shorts between commutator bars is the drop of potential method. This will require a low reading voltmeter and points that will give a perfect contact. Current will have to be put through the armature and the amount used will govern the voltage reading between the commutator bars. If there is a short between bars the voltmeter reading will be zero.

1913 COLE WIRING

Q—Explain the wiring of the 1913 Cole. According to the instruction book the Delco 6-24 volt system used is ungrounded. Recently upon tracing short circuits several terminals were found connected to the frame of the car just underneath the front toe board, which seem to be grounded.—Charles J. Green, Hamilton, Ontario, Canada.

It is an ungrounded system, but perhaps somebody has added a few wires for some purpose and has used the grounded system on these. Why worry if it does its work?

SAFETY SPARK GAP

In the April 22 issue a statement was made that the safety spark gap was connected in series with the primary circuit. The gap is connected in parallel with the secondary and is there as a protective device in case the secondary or high tension circuit is opened up due to a broken or loose connection. If this device was not connected, opening the secondary would induce a very heavy and destructive current in the secondary winding of the coil, with the result that the winding would be punctured.

INTERSTATE ELECTRIC SYSTEM

Q—Publish wiring diagram of the 1913-14 Interstate.

2—Publish internal connections.

3—Why is each cell wired independently?—Ray Sanders, Austin, Minn.

1—The Apelco system used on the 1913-14 Interstate is shown in Fig. 4.

2—See Fig. 9.

3—In this car the motor dynamo consists of a series and shunt wound dynamo in which field current passes successively through the shunt and series field in opposite directions, producing a bucking series regulation and preventing the voltage from going beyond a predetermined point. The current output of the dynamo is proportional to the engine speed, being large at high speeds and small at low speeds. The controller has three important units, the main switch, cut in, and battery stop charge. The main switch consists of twelve blades working on a central shaft to which the control lever is attached. When the control lever is moved forward into the starting position the main switch engages twelve clips on the opposite side, connecting the five battery cells in parallel. It also brings into action the shunt field of the dynamo battery stop charge and cut in. When the controller lever is moved to the neutral or off position, the two long blades are disengaged from two of the clips breaking the ignition circuit and the dynamo field circuit. The cut in consists simply of an electro magnet having a movable armature hinged at the top, and which has at the lower end a platinum contact which makes contact with a similar platinum contact attached to the body of the cut in.

The magnet secures its magnetic force from a coil wound around the iron core, this coil being connected across the D-1 and D-2 leads of the dynamo. Around the same coil is a second coil of heavier wire, one end of which is connected to the cut in body and the other end to the platinum contact attached to the casting on cut in body.

When running the car at low speed the generated voltage of the dynamo is lower than that of the batteries, but as the car is speeded up and the dynamo voltage increases to a point somewhat above battery voltage, the energizing coil of the cut in becomes strong enough to cause the armature to be pulled in so that the two platinum contacts come together. The dynamo is then charging the storage batteries. Whenever the car is slowed down to the point where the voltage of the dynamo equals the battery voltage, the balancing spring attached to the armature causes it to move out, breaking the circuit between the dynamo and the batteries. When this occurs the small lamp on the top of the controller case will burn and is an indication that the car speed should be increased.

The battery stop charge is the lower of the two relays and in construction is similar to the cut-in with the exception that when the armature is in its outward position it is making contact with the small adjusting screw. As the battery voltage increases, the energizing coil which is connected direct to the battery, magnetizes the iron core, causing the armature to be attracted to the pole pieces, breaking the contact between the adjusting screw and the platinum contact attached to the armature. As soon as this contact is broken the current is forced to pass through a resistance coil wound around the magnet which reduces the flow of the current through the fields of the dynamo, weakening then and causing a corresponding drop in dynamo voltage. In this way, that is, by controlling the field intensity of the dynamo, overcharging the storage batteries is impossible.

TO assist readers in obtaining as a unit all information on a certain subject MOTOR AGE segregates inquiries in this department into divisions of allied nature. Questions pertaining to engines are answered under that head and so on.

The Electric System

Edwin Swisher.....Indianapolis, Ind.
Mervin Barackman.....Dewesse, Nebr.
Reader .....Beatrice, Nebr.
Charles J. Green.....Hamilton, Ont., Can.
Chas. Briggs.....Chicago
Ray Sanders.....Austin, Minn.
G. T. McMGraw.....Pierson, Ia.
Benjamin Bush.....Masontown, Pa.
C. A. Walter.....Beloit, Kans.

Engines

A. Brown.....Omaha, Nebr.
Ralph L. York.....Corvallis, Oregon

Rebuilding

William Linkham.....Regina, Sask.
F. von Husen.....San Francisco, Cal.
R. W. Jackson.....Chisholm, Minn.
Allen Wood.....Geneva, Ohio
Charles J. Campbell.....Janesville, Wis.

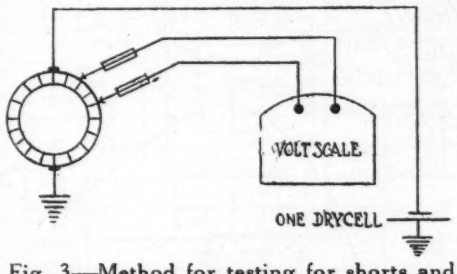


Fig. 3—Method for testing for shorts and open circuits in the coils of the armature. A milli-volt scale meter is used

BATTERY SYSTEMS

Q—What is the advantage in using a 12-volt system?

2—Does it drain a battery faster than a 6-volt system?

3—Which system absorbs the most power from the engine?

4—Is there any difference in the batteries used in the two systems?—G. T. McGraw, Pierson, Iowa.

1—We do not believe there is any particular advantage gained by the use of a 12-volt system. With 12 volts the construction of the generating and starting machinery is different than if 6 volts are used.

2—The 6-volt system draws more from the battery than the 12-volt system, but the batteries of both are so constructed as to handle the conditions.

3—The load on the generator will be the same because it will be 1-2 the voltage and twice the amperage in one case and twice the voltage and 1-2 the amperage in the other case.

4—The construction of the batteries is different in the two systems. Because of the slower discharge rate of the 12-volt battery, about one-half of the number of square inches of plate surface are provided.

GENERATOR OUTPUT

Q—Publish chart showing the amperage output curve of Auto Lite generator used on a 1920 Peerless 56.—Benjamin Bush, Masontown, Pa.

The output curve is shown in Fig. 7. Note that this curve is plotted against

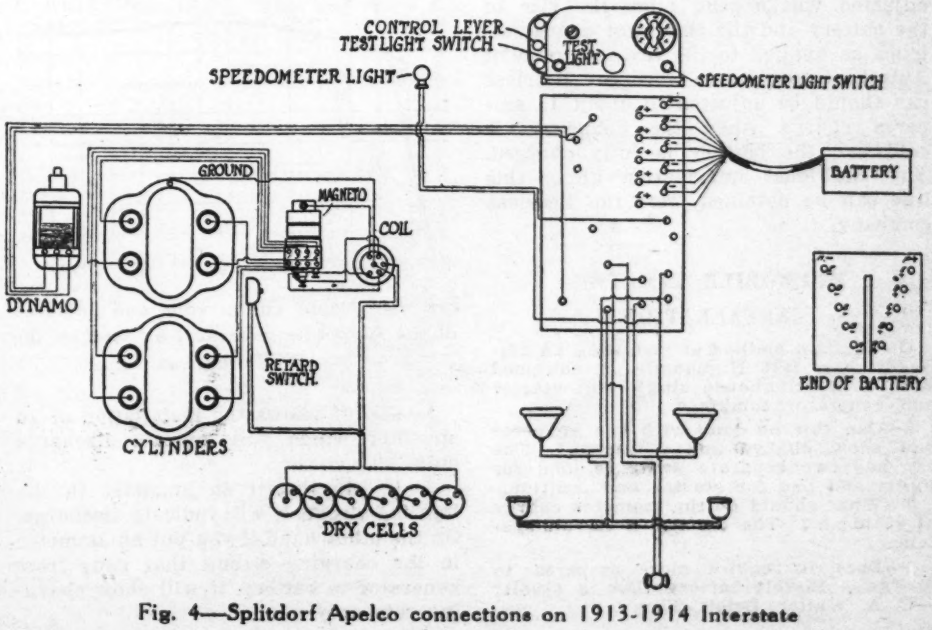
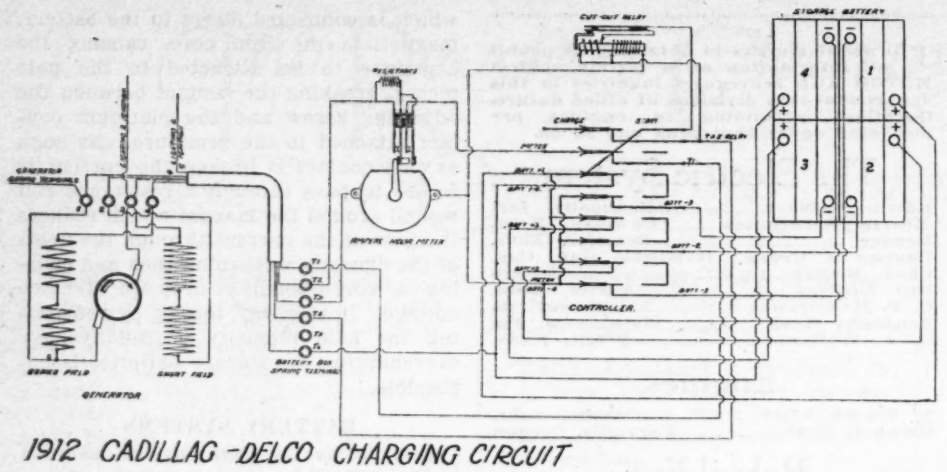
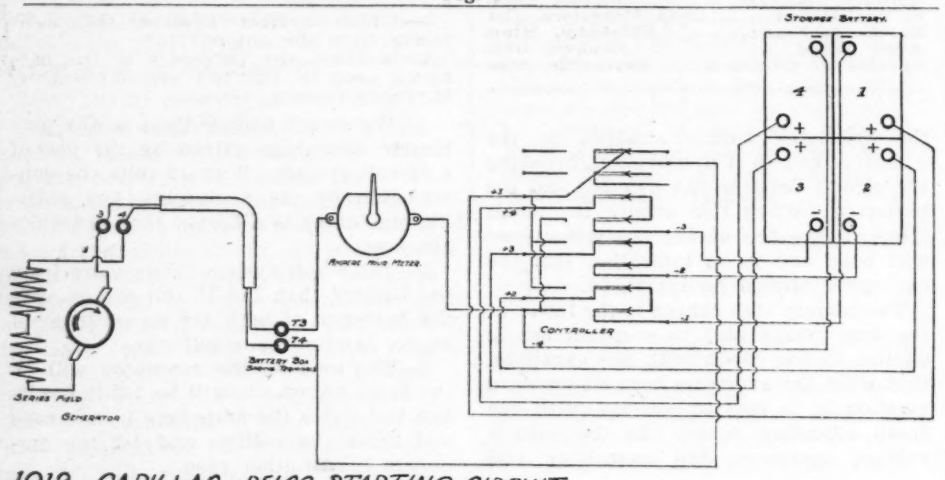


Fig. 4—Splitdorf Apelco connections on 1913-1914 Interstate



1912 CADILLAC -DELCO CHARGING CIRCUIT

Fig. 5



1912 CADILLAC -DELCO STARTING CIRCUIT

Fig. 6

generator speed and that it shows a maximum output of 16½ amperes and is not plotted against car speed in miles per hour. The maximum value is not one that the company would recommend, but the curve is characteristic of this generator. The application of these units will vary with conditions met in mounting the speed ratios available. The output for which the generator is adjusted will depend upon the size of the battery and the generator characteristics as applied to the car. At present Auto-Lite generators for the Peerless car should be adjusted to about 15 amperes charge when the generator is cold and the battery is fully charged. Any additional information along this line can be obtained from the Peerless company.

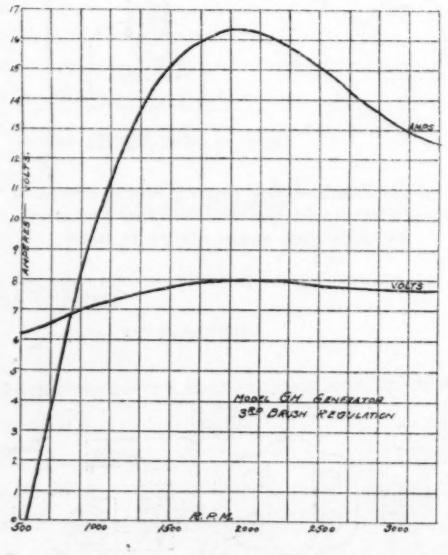


Fig. 7—Output curve, volts and amperes of the Auto-Lite generator as used on the 1920 Peerless

HUPMOBILE AMMETER INSTALLATION

Q—Explain method of installing an ammeter on a 1915 Hupmobile, K, equipped with a Westinghouse single-unit starter and generator combined.

2—Can this be done with one ammeter and show charge and discharge? The car has two separate switches, one for lights and one for starter and ignition.

3—What should be the ammeter charge at 20 m.p.h.? The car has a 12-volt system.

4—Does it require more amperes to charge a 12-volt battery than a 6-volt? —C. A. Walter, Beloit, Kan.

1—Fig. 10 shows the installation of an ammeter which will indicate discharge only.

2—If you install an ammeter in the lighting circuit it will indicate discharge. On the other hand if you put an ammeter in the charging circuit that runs from generator to battery, it will show charging rate only.

3—The charging rate should be about 15 amperes at 20 miles per hr.

4—The charging rate for 12 volt batteries can be the same as for 6 volt batteries. In the case of a 12 volt battery the source of charging current needs to be only half that for a 6 volt battery.

FIELD WINDINGS

Q—Publish diagram of field windings for starter generator on a 1912 Cadillac; also for tracing currents from starter generator to meter and fingers, thence to battery.—Riverside Garage & Motor Co., Riverside, Ill.

See Figs. 5 and 6.

DELCO 24-VOLT SYSTEM

Q—Publish diagram and give operation of the Delco starting and lighting system on a 1913 Model 53 Oldsmobile and Oakland 6-60. How is the regulator operated on this system?

2—How loose can the silent timing chains be before there is danger of jumping?

3—How can a double ignition system be installed with battery ignition and distributer and two sets of plugs? Will it add power and speed?—Twin Oaks Garage, St. Paul, Minn.

1—Wiring diagram of the 1913 Oldsmobile 54 is shown in Fig. 8. Diagram of the Oakland 6-60 appeared in the April 1 issue of MOTOR AGE.

2—The principal units of the system are: A two-pole motor generator with a single armature winding, which generates at 6 volts and cranks at 24 volts; a storage battery consisting of four groups of three cells each, connected to a controller in such a way as to permit of series or parallel grouping; a dual ignition system using current from the generator and also providing for ignition from the dry cells. The system is ungrounded. The lamps used are 6-volt lamps. The following cycle of operations is necessary when starting the car with this apparatus. First, the ignition switch button marked "start" is pressed in, which puts the ignition system on the dry cells and gives a vibrating spark. When the starting button is depressed, it closes the circuit around the cut-out relay and through the magnetic latch coil, operating the motor generator as a 6-volt series motor. With the system in operation as mentioned above, the clutch pedal is pressed down, the gears are meshed and the controller thrown over to the 24-volt side, connecting the series windings of the motor generator directly to the 24-volt battery. As the gears between the motor pinion and the teeth on the fly-wheel are now meshed, connecting the flywheel directly with the armature of the motor generator, the latter will crank the engine, and at a speed approximately 20 to 30 revolutions per minute. It should be noted particularly that during the cranking operation, the armature of the motor generator is revolving at approximately 20 times engine speed and therefore is slipping the driving clutch on the front end. Now, when the engine picks up and fires, during the instant that the gears are still in mesh and the engine is running faster than the armature of the motor generator, the starting clutch will be slipping and the driving clutch taking hold. These points should be kept in mind, as they

explain the reason for the presence of such clutches in this apparatus, and are necessary to a clear understanding of the operation of the motor generator.

The cut-out relay, Fig. 11, consists of a set of contacts that are held open by the tension of spring B, and closed by an electro-magnet which overcomes the tension of the spring. They should be open when the engine is at rest. The electro-magnet has a compound winding consisting of a voltage coil of many turns of fine wire, which is connected across the generator terminals, and a current coil of a few turns of coarse wire, which is connected in the charging circuit between the generator and the battery, and is energized only when the cut-out relay contacts are closed.

When the engine is started, the generator voltage builds up, and when it reaches a value of between 6½ and 7¾ volts, the current passes through the voltage winding and produces enough magnetism to overcome the tension of the spring "B," attracting the armature "C" to the core "D," which closes the contacts "A." These contacts close the circuit between the generator and storage battery. The current now flows through the current coil, thus strengthening the pull on the armature, and holding the contacts closed.

When the generator slows down, and its voltage drops below that of the storage battery, current flows from the battery to the generator in the reverse direction through the current coil. The direction of the flow of current through the voltage coil, of course, remains unchanged. The magnetism produced by the current coil now opposes that produced by the voltage coil, so that the resultant magnetism is not sufficient to hold the armature closed against the tension of the spring "B." This causes the contacts to open, thus preventing any continued discharge of current from battery to generator. The relay should cut out when the discharge current reaches a value of between 0 and 1 ampere.

In order to adjust a relay to cut out at the proper discharge current value, two things must be kept in mind. The tension on the spring, and the air gap between the armature and core. The air gap has little or no effect upon the point of cut-out, whereas the spring tension governs this almost entirely. On the other hand, the point of cutting in is governed by both air gap and spring tension.

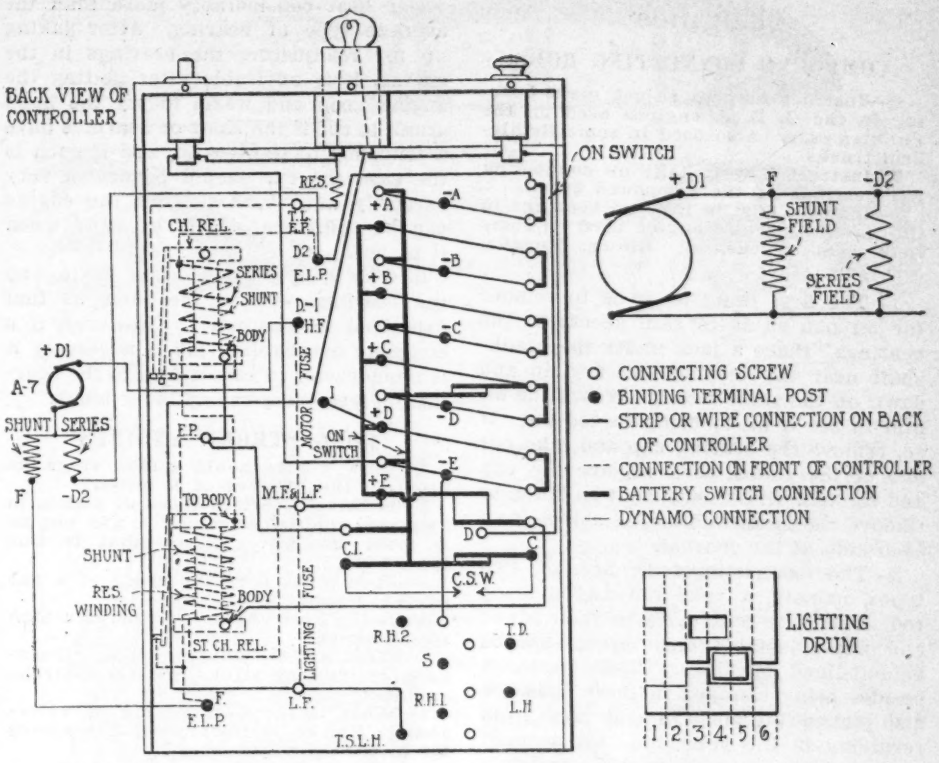


Fig. 9—Internal connections of the control unit viewed from the rear of the Splitdorf Apelco system as used on the 1913-1914 Interstate

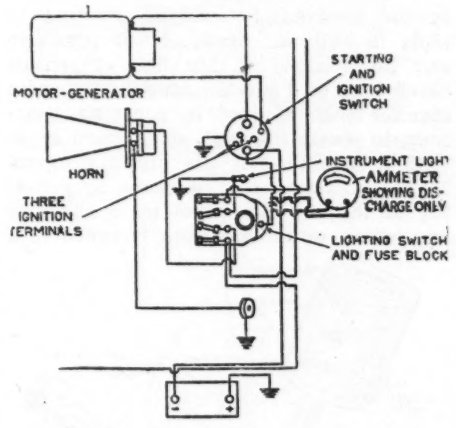
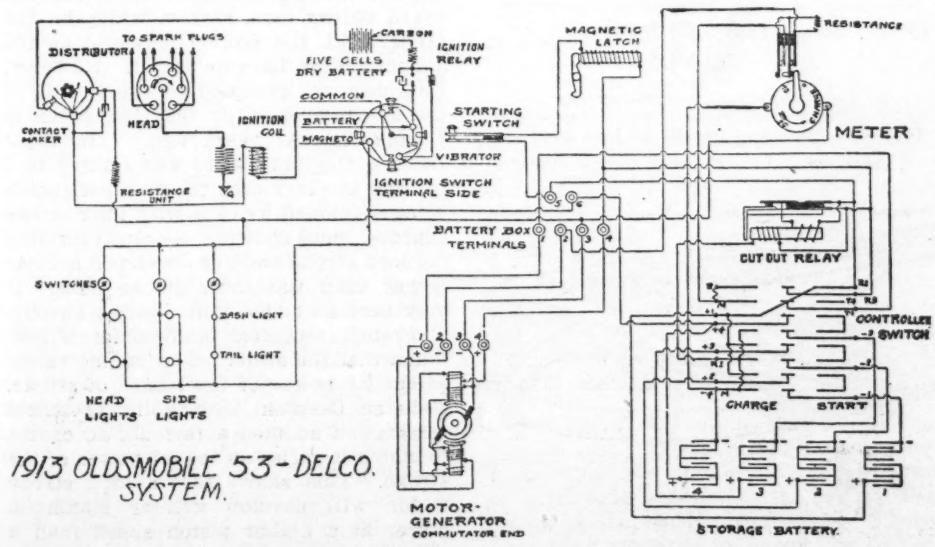


Fig. 10—Connections for ammeter on 1915 Hupmobile. This will show discharge only

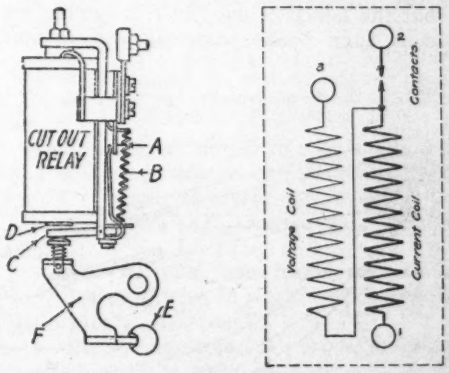
2—It is very hard to staate just how loose the chain can get before it will jump the gear teeth as the looseness in the silent chain grows so gradually. The amount of looseness may be determined by grasping the shaft and rocking it back and forth. If there is any great amount of looseness the proper valve timing will be destroyed and adjustments should be made or a new chain installed.

3—Double ignition is of advantage because of its great reliability and because it gives two sparks in different parts of the cylinder. A double system is being used at the present time in the Pierce Arrow cars. You can obtain information on this type of ignition from any of the ignition companies such as Delco, Remy, etc.



1913 OLDSMOBILE 53-DELCO. SYSTEM.

Fig. 8



Cut-out relay

Fig. 11—Cutout relay Delco make used on 1913 Oldsmobile

Engines

COMPOUND CONNECTING RODS

Q—Instruct how to adjust main bearing in the G. B. S. engines used on the Pullman cars. Also used in some Bethlehem trucks.

2—Instruct how to take up connecting rod bearings of the compound type.

3—Instruct how to take up bearings in the North American engine used on some Bethlehem trucks.—A. Brown, Omaha, Neb.

1—The first thing to do is to remove the oil pan so as to gain access to the bearings. Place a jack under the crankshaft near the bearing and pry up and down on the shaft slowly. Watch the oil film to see if oil is being forced out. If so, remove the bearing cap and take out one of the shims, then replace the cap and tighten. Great care must be taken to remove the same number of shims from each side of the journal.

2—The connecting-rods are of two types, namely, a yoke rod and a blade rod. The yoke rods carry at their lower and non-adjustable ends bronze-backed babbitt-lined bushings. These bushings besides being clamped in these rods are also pinned into place to keep them from revolving in the yoke end. On account of the better wearing qualities when a high pressure oiling system is used, these bearings will run for many thousands of miles without attention. However, if as the result of improper lubrication these bearings have too much play on the crankshaft the bushings should be replaced by new ones. The bearings of the blade rod are formed by the inside diameter of the lower end oscillating over the center outside diameter of the forked connecting-rod bushing. This bushing does not revolve, but acts much in the same manner as the wrist-pin bearings in the piston and therefore, with proper lubrication, has far more durability than the ordinary type of connecting-rod crankshaft bearing. These blade rod bearings, however, are made adjustable and liners varying in thickness from .002 to .006 of an inch are placed between their caps and the rods when the engine is assembled. To readjust, remove such liners as are necessary and remember that these bearings should not have less than .003 of an inch clearance.

In no event should any of the connecting-rods or crankshaft bearings ever be taken up as tight as is the usual practice in the ordinary engine, for the reason that the bearings used in this engine are of a very dense material and expand under heat considerably more than the average type of bearing. After taking up for readjusting the bearings in the engine, it is advisable after getting the engine good and warm to try the hand crank to see if the shaft or bearings have a tendency to tighten up, and if such is the case the car should be driven very carefully until such time as the engine can be spun over freely by hand when it is hot.

3—The general method of taking up the bearings will be the same as that explained in question 1. However, if a complete overhauling job is necessary it is much easier to gain access to the bearings by removing the cylinder block.

LONG STROKE ENGINES

Q—How tight should piston rings be fitted in the grooves of a piston?

2—Is there a certain speed of piston, in feet per minute, at which a gas engine is most efficient? If so, what is this speed?

3—Upon what does the speed of a gas engine depend?

4—Is the Ford engine considered a high speed engine?

5—What are the advantages and disadvantages of long stroke and short stroke engines?

6—What is the best setting of valves and ignition on stationary engines, speeds 175 to 500 r.p.m.?

7—Give design of cam that will give best results on an engine running 450 r.p.m.—Ralph L. York, Corvallis, Oregon.

1—The piston rings should fit snugly in the grooves, but should be free to slide in and out easily. If it binds in any place apply a thin film of red or black lead or Prussian blue in the same manner that is used in scraping bearings, to locate the high spots, then dress with a smooth, flat file and try again. Tight rings may also be eased by grinding or lapping the edges on a sheet of fine emery or crocus cloth fastened to a flat board. The ring should be rubbed backward and forward with a downward pressure as shown in Fig. 15. Lapping should not be continued for very long on one side, but the ring should be turned over occasionally. To dress down a piston ring requires some skill and a good mechanic will select a ring which will demand the least amount of trimming. Most manufacturers now cut grooves in the ring and grind the face and edges of the rings to a gage, making very little hand fitting necessary.

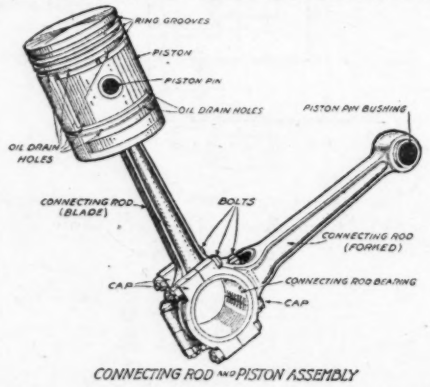


Fig. 13—Showing details of fork and connecting rod used on V-type engine

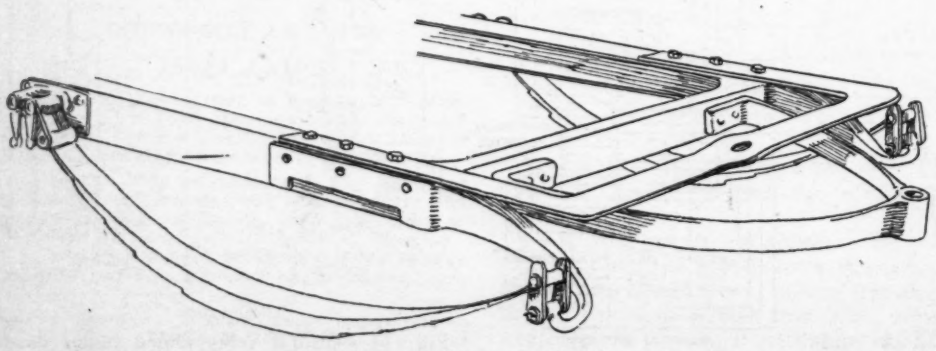


Fig. 12—Method of connecting either of two trailer connectors to Maxwell 25

2—The most efficient speed of a gas engine is at a speed of about 22 m.p.h. or an engine speed of about 1000 piston ft. per min.

3—The things which govern the speed of a gas engine are weight of the reciprocating parts, size and number of valve ports, valve action and ignition, the most important of these being the size of the valve ports. This is true because tests show the greatest volumetric efficiency, maximum power and speed are attained at a gas velocity of about 13,000 ft. per minute and that after this point is reached power, speed and volumetric efficiency fall off very fast.

4—The Ford engine is not a high speed engine as it reaches its maximum horse power at 1650 r.p.m.

5—The first engines built for automobiles for the most part had a comparatively long stroke, 50 per cent or more longer than the cylinder bore automobile engine designers in this respect following the practice of stationary gas engine designers. Then came the era of the short stroke, high rotary speed engine, inaugurated by Bouton and Buchet in France. The short stroke engines of these engineers certainly weighed considerably less, horsepower for horsepower, than any previously produced, and so their examples soon found many followers. Since that time, about 1900, whenever it was desired to produce an engine of high weight efficiency, the stroke was made less or equal to the bore. For a time the opinion prevailed that the power output did not depend upon the bore at all; that a 4x4 inch engine, for instance, would develop as much power as a 4x6 in. engine, by giving its maximum output at a rotative speed 50 per cent, higher, while, on the other hand, the power increased as the square of the bore or faster. However, this idea was exploded by the results of the so-called 4-in. or 100 mm. races in Europe several years ago. In these races the cylinder bore was limited to 4 in., and in every case the greatest speeds were developed by cars with long stroke engines, thus showing conclusively that the long stroke engines developed greater power than the short stroke ones. It may here be added that Charles Faroux, a French technical automobile writer, found that the output of an engine varies as the 0.6 power of the length of stroke, and the German Automobile Technical association adopted a formula according to which it varies as the 0.7 power of the stroke. This shows that a long stroke motor will develop greater maximum power at a higher piston speed than a short stroke engine. A long stroke en-

gine also has the advantage that the same volumetric efficiency is obtained at a high piston speed and it is a well known fact that the decrease in volumetric efficiency is the chief factor limiting the working speed of gasoline engines. The weight of the long stroke engine will be somewhat greater than the short stroke engine, but this difference in weight does not offset the other advantages gained. The ratio of the bore to stroke should be governed by the service for which the engine is intended.

6—For operation at this low speed the inlet valve should begin to open and should close at the beginning and end of the inlet stroke respectively, and the exhaust valve should open a trifle before the end of the power stroke and close at the end of the exhaust stroke. The ignition should be timed so that spark occurs shortly after the piston has reached to dead center.

7—The design of cam that will give the best results is the tangential cam shown in Fig. 16. Full details as to the layout of this cam and other types of cams are given in The Gasoline Automobile by Peter M. Held.

Rebuilding

FORD REBUILDING

Q—I want to install larger valves on a Ford racer, and have noticed you recommend Dodge valves; these have such a large stem, however. Should they be turned down or the stem guide reamed out?

2—Where could I buy larger valves with ⅜-in. stem?

3—Could the Sudig plugs be used if another hole were drilled, and are these plugs a success?

4—How much could the exhaust and intake ports be enlarged?

5—An Atwater-Kent system is used; when running at high speed the engine misses on one cylinder. What is the cause?—William Linkham, Regina, Sask.

1—It would be advisable to turn down the valve stem because of the fact that if a mistake is made in reaming out the guide it would be much more expensive to correct the mistake than if it had been made in turning down the valve stem.

2—Valves can be obtained from any of the following: Ford-Clark Co., Cleveland, Ohio; Laminated Valve Co., 116 S. Michigan avenue, Chicago; Hill-Smith Metal Goods Co., Dept. H, Boston, Mass.

3—Information as to the best way to install these plugs can be obtained by writing to the Superior Motor Power Co., 135 Fifth avenue, New York.

4—It is not advisable to increase the valve size any larger than the Dodge valve size as the metal gets pretty thin. The Dodge valve size is 1.6875 in., the stem .372 in. The Ford valve is 1.421875 in. and the stem .311 in.

4—This may be caused by the ignition or by poor carburetion.

Make a thorough examination of the engine, see if the compression is all right, adjust the carbureter and clean the spark plugs. See if the points of the plugs are not too far apart. Go over the ignition system carefully to determine if all of the connections are tight.

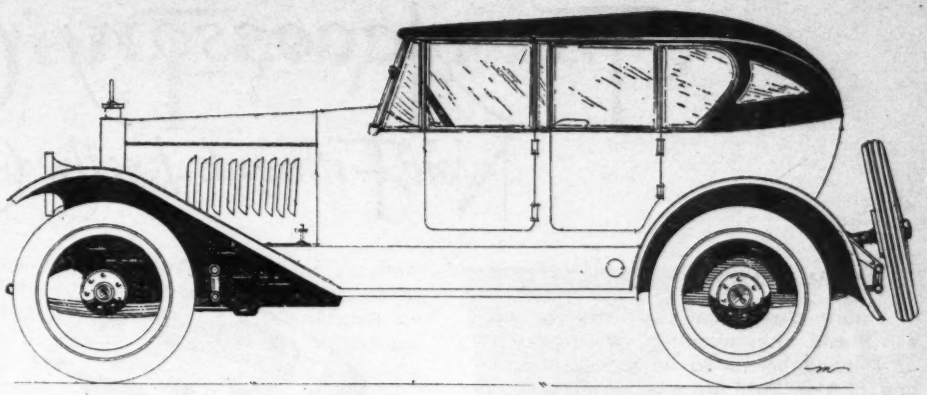


Fig. 14—A special top designed for a 1915 Haynes

Fig. 15—Lapping in a piston ring

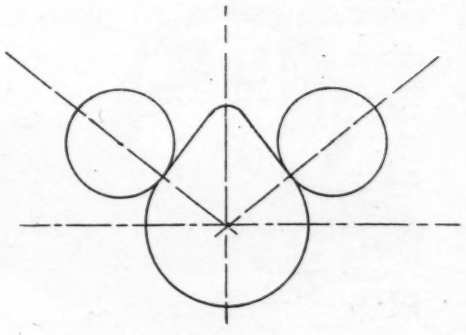


Fig. 16—A tangential cam is one having its straight flanks tangent to the radial portion

The missing may be caused by a momentary short that occurs at high speeds, due to the vibration. If the engine misses only at high speeds the spark plugs are probably at fault. The trouble may be caused by a defective coil, or if a battery is used it may be a result of a weak battery.

TRAILER ATTACHMENT

Q—Illustrate and instruct proper method of attaching a trailer to a Maxwell 25.—R. W. Jackson, Chisholm, Minn.

It is rather difficult to devise a trailer for this car. Probably the best method is to make the connection in the form of a triangle secured to the end of the frame at the spring connection. There have been attempts to secure the trailer to the rear end of the springs by the use of special shackle bolts but they have proven unsatisfactory because the spring becomes overloaded and its purpose is interfered with. Fig. 12 shows two ways of attaching a trailer.

HAYNES SIX DESIGN

Q—Illustrate how a top on a 1915 Haynes Light Six, 30, could be altered to hang low in back with curved drop, also plate glass sides, and with slanting windshield.—F. von Husen, San Francisco, Cal.

Shown in Fig. 14.

REBUILDING A HUPMOBILE

Q—In what year was the Hupmobile 20 built?

2—Could it be remodeled into a speedster and what speed should it be capable of attaining?

3—What make of carbureter would work the best for speed?

4—Can a D U 4 Bosch set spark magneto be made variable?—Allen Wood, Geneva, O.

1—The Hupmobile 20 was made in 1912.

2—This car can be remodeled into a very good speedster and should be able to attain a speed of about 65 to 70 m.p.h.

3—There are many carbureters which may be suitable for this job. The Miller, the Stromberg, the Rayfield, the Zenith, the Schebler and many other carbureter companies have built carbureters for some of the fast racing cars.

4—The Bosch D U 4 magneto can not be made variable.

CYCLECAR BUILDING

Q—What is the address of the maker of the Henderson motorcycle?

2—Give horsepower of the Henderson engine.

3—Is a 2 by 3 in. ash suitable for frame of cyclecar?

4—Are buggy springs too light for a cyclecar, that is, for semi-elliptic springs?

5—What should be the wheelbase of a cyclecar? Is 86 inches long enough?—Charles J. Campbell, Janesville, Wis.

1—Henderson motorcycle is made by the Excelsior Motor Mfg. and Supply Co., 3701 Cortland street, Chicago, Ill.

2—The N. A. C. C. horsepower rating is 22.6.

3—A 2 by 3 in. ash frame will be a very desirable size to work with and will have plenty of strength.

4—Buggy springs, if properly suspended, will be very satisfactory.

5—An 86 in. wheelbase is long enough for any cyclecar.

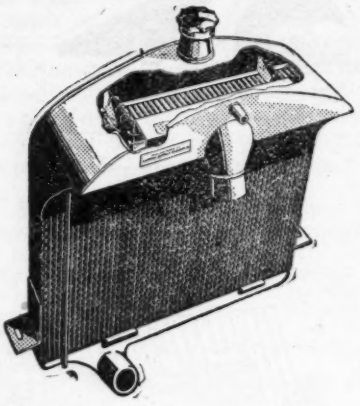
The Accessory Corner

New Fitments for the Car

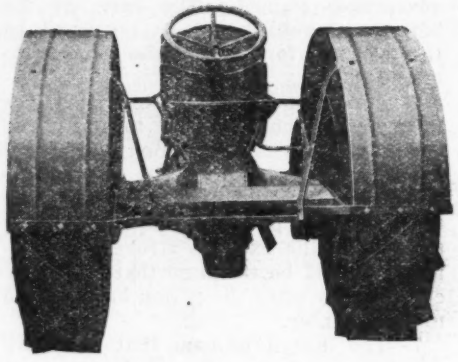
New Curran Radiator

A new thermostatic control radiator for Fords, the invention of Dr. Curran of Detroit, seems to be the solution of one of the Ford owners' problems, the problem of engine overheating and damage by freezing. Dr. Curran's original radiator was designed to fill the Government's war-time demand for an absolutely leak-proof cooling system for the Liberty engine used in the DeHaviland 4 aeroplane. His invention was accepted by the Government and at the close of the war he developed a radiator for motor cars and trucks. The thermostatic control is a simple self-adjusting device which regulates the circulation of water. The water itself decides how much or how little additional cooling is necessary. The upper tank of the radiator is divided on opposite sides by vertical plates of different level. Since heat expands water when the reservoirs are too warm, the water rises, spilling in adjacent central sections. When speed is reduced, the water automatically drops back to the smaller circulation.

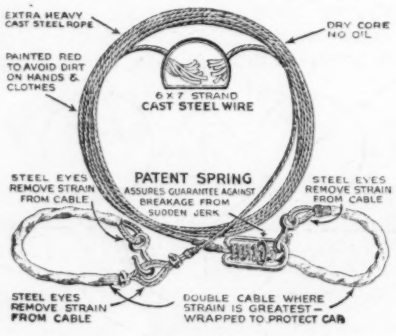
The engine is thus run summer and winter at an even temperature of about 170 deg. Another feature of this radiator is that the core is so constructed that air passes through it at an angle of 30 degs. with a down draft directly on to the top, front, and sides of the engine. It is claimed that this increases cooling power at least 100 per cent, which is necessary, as a gallon of water turns over 2½ times oftener in the Curran than in the usual Ford radiator. It is claimed that a stock radiator was frozen 18 successive times without injury; and a car equipped with it was driven 10 miles in low gear, through mud up to the hubs, without the radiator boiling or the engine showing the least indication of overheating. The radiator shown in the illustration is manufactured by the Curran-Detroit Radiator Co., 558-570 LaFayette Blvd., West, Detroit, and the Ford type sells for $32, F. O. B.



Curran radiator for Fords has thermostatic control



Fenders for the Fordson tractor


EXTRA HEAVY CAST STEEL ROPE
DRY CORE NO OIL
PAINTED RED TO AVOID DIRT ON HANDS & CLOTHES
6 X 7 STRAND CAST STEEL WIRE
PATENT SPRING
ASSURES GUARANTEE AGAINST BREAKAGE FROM SUDDEN JERK
STEEL EYES REMOVE STRAIN FROM CABLE
STEEL EYES REMOVE STRAIN FROM CABLE
STEEL EYES REMOVE STRAIN FROM CABLE
DOUBLE CABLE WHERE STRAIN IS GREATEST — WRAPPED TO PROTECT CAB

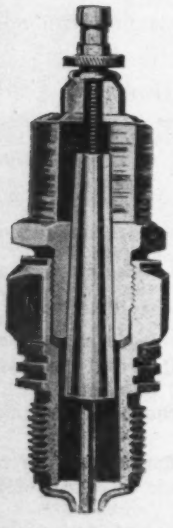
Cooper tow line has a spring to take up jerk

Polson Super Belt

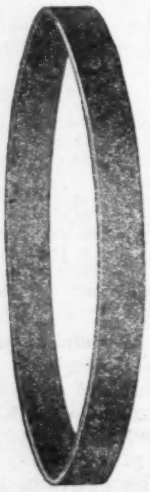
The Polson Super Belt recently placed on the market is making a wonderful record because of its excellent wearing quality. It is a product of the Polson Rubber Co., Cleveland, and is made of red rubberized belting duck, individually molded into correct form and is an endless belt. It is claimed to be oil, heat and water proof and that it will not stretch, fray or separate.

F. M. C. Spark Plug

A new all-mica-insulated spark plug is being placed upon the market by the Ford Mica Co., Inc., 14 Christopher St., New York, to meet the demand for a quality plug, that is cleanable, practically sootless, dependable and durable. Among the features of this plug is the fact that it is insulated with mica, one of the best insulators known. The mica core insulation is made extra thick to insure durability. It covers the central electrode, which is conical, where it enters the body of the plug. The effect of this conical construction is to make the plug leakproof for compression it simply tends to force the electrode outward, thereby tending to make this part of the plug still tighter. There are only two parts to the plug and it can easily be taken apart to clean. It is being made for all classes of service and retails at $2.



F. M. C. all mica insulated spark plug



Polson super belt is claimed to be heat, oil and waterproof

Fordson Fenders

Fenders are very desirable and a necessity, as they give the driver protection from dust and mud. The illustration shows very clearly how the fenders are constructed and the method of attaching them. The braces do not interfere with the drive getting in or out, they are made of heavy material to withstand practically all vibration. The fender is made of No. 20 gage steel and reinforced with 1-in. T-iron.

They are manufactured by Moore Manufacturing Co., Waterloo, Iowa, and sell for $40.

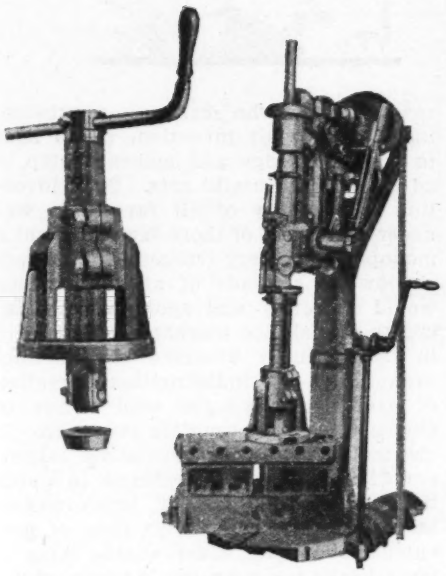
Cooper Tow Line

The Cooper tow line has for its principal feature an ingenious patented spring which it is claimed will take up the jerk, prevent breakage, and eliminate the bending of axles, and loosening of springs, which troubles are a common consequence of ordinary tow lines. The cable is made of extra heavy cast steel wire, 6x7 strand dry core.

This tow line is manufactured by the Cooper Mfg. Co., Marshalltown, Iowa, and is listed at $8.

Service Equipment

Time Savers of the Shop



The Dunn reborer will handle any cylinder diameter from 2⅞ to 4¼ in.

Dunn Reborer

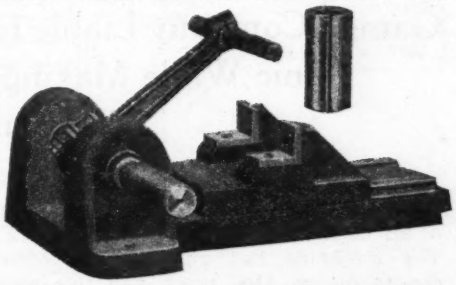
The reborer shown in the illustration will handle 95 per cent of all engines. Cylinders will wear out of round and will enlarge through use up to the point where compression loss becomes a serious matter. This means that a regrinding or reboring is necessary. It is claimed that the Dunn reborer which sells for $60 will rebore any cylinder block in 2 hrs. time. It is finally adjustable and quickly attached and even an unskilled workman can operate it successfully. For shops equipped with a drill press 20 in. and over, they can furnish for $7.50 coupler which will quickly adapt the reborer to drill press drive. This device will handle any block with a cylinder diameter ranging from 2⅞ to 4¼ in. Its extreme depth action is 10 in. It is manufactured by the J. Edward Dunn Co., No. 1 Bethune St., New York.

Imperial Welding Outfit

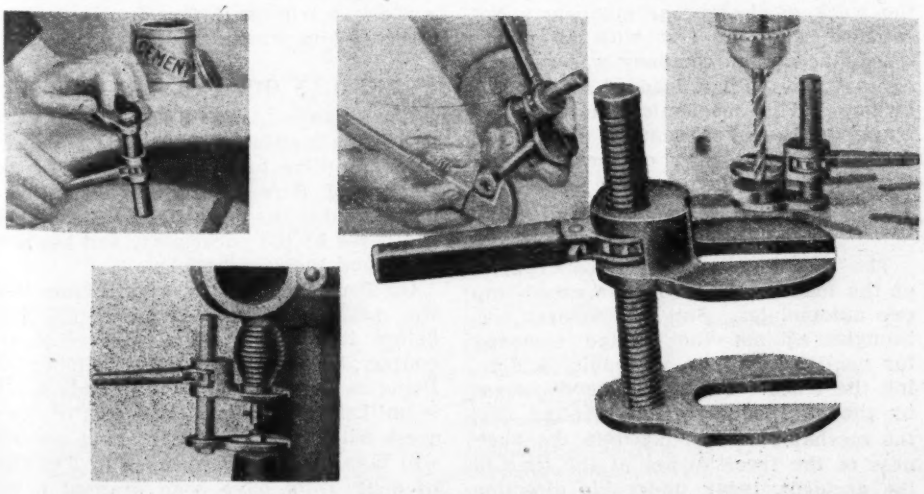
Every service station should be equipped so as to handle certain kinds of work speedily and efficiently. In many cases broken machinery, tools, castings, patches, etc., can be welded at low cost and the work can be turned out much quicker than if a new part was ordered. The portable welding outfit shown in the illustration occupies very little space, it is light, compact, durable, and all parts are quickly interchangeable. This welding outfit is manufactured by the Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, and sells for $75.

Morgan Utility Tool

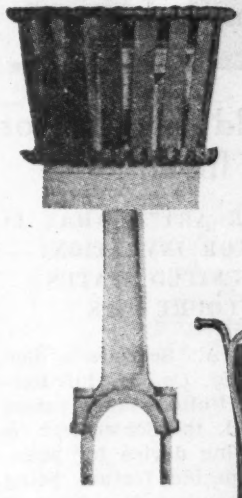
The Morgan utility tool and valve lifter is composed of a stamped steel base; the screw is machined from cold rolled steel and the sliding part is malleable iron casting. The handle is of steel pressed up and riveted together. The illustration shows just a few of its many uses which are so innumerable that



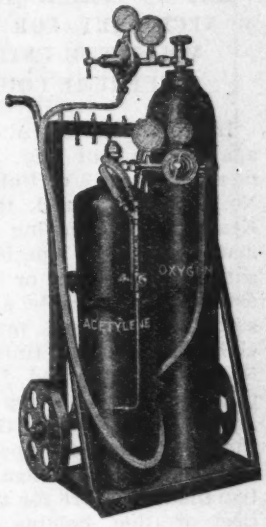
Connecting rod aligning machine for Ford connecting rods



This shows a few of the uses to which the Morgan utility tool may be put to



Left—Cady piston ring condenser is drawn over the lower end of piston and piston ring is held compressed by its spring action



Right—Imperial welding and cutting outfit is light and compact. Parts are interchangable

every owner and service station mechanic would find it a very helpful apparatus. This tool is manufactured by the Morgan Mfg. Co., Keene, N. H., and sells for $2.

Piston Ring Condenser

There has been a great demand from the garages and repair shops for a good piston ring compressor that will take care of various size rings. It is claimed that the Cady compressor shown in the illustration meets the demand. With this compressor you simply draw the compressor over the lower end of piston a short distance and place piston in cylinder and with a little pressure on top of piston, the spring at the lower end of the compressor automatically closes the rings as they pass into the cylinder. The compressor manufactured by George B. Cady, Canastota, N. Y., is readily adjustable from 2¾ in. to 4½ in. and sells for $3.00.

Connecting Rod Alignment Machine

The machine shown is adjustable so that any connecting rod can be straightened or lined up. The arbor pins are for Ford connecting rods. Bushings are used for different sized crankshafts. This device is a product of the Carswell-Hammond Mfg. Co., Boone, Iowa. It is a very useful and handy device for any service station.

Law in Your Business

By Wellington Gustin

SEEMINGLY knotty legal problems are constantly arising in the dealer's business, which even a slight knowledge of the law easily may solve. MOTOR AGE presents here the most common legal problems which confront the dealer. Mr. Gustin, a member of the Chicago bar, not only is well versed in the law relating to the dealer but presents it in such a way as to be readily understood by the layman. In addition to his articles, Mr. Gustin will gladly answer such individual inquiries on knotty points as may be submitted him.

Patents Held Invalid for Lack of Invention

WHAT IS "PRIOR ART"?—WHAT IS NECESSARY FOR INVENTION? WHAT THE UNITED STATES SUPREME COURT SAYS

In the suit of A. Schrader's Son against the Dill Mfg. Co. for infringement of claim 3 of United States patent No. 783,469, issued to Schweinert & Kraft, for a clamping device for pneumatic tires, the specific feature being a protective casing or cap for stay bolt extension, applicable also to tire valve stem casings; and for infringment of claims 1 and 2 of United States patent No. 1,253,573, issued January 15, 1918, to Burke, for dust cap for valves, such as tire valve stems, the United States Circuit Court of Appeals has affirmed the judgment of Judge Westenhaven of the District Court for the Northern District of Ohio, holding both patents invalid. The patent issued to Schweinert & Kraft was found invalid for lack of invention in view of the prior art, and the Burke patent was found invalid for the reasons that Burke was not the real inventor of the device of the patent, and that the claims in suit did not involve invention in view of the prior art.

The subject of "prior art" is a very broad and important one. Every garageman and mechanic should understand its general principles. The most common objection to patents is that they do not show invention—do not show an advance in the prior art. More often it is found that one is claiming invention for a patent which is really no step in advance of the knowledge of brother workers in the trade or industry. Common knowledge of those skilled in any field of endeavor to an invention in that field is called the prior art.

The Supreme Court of the United States laid down these important observations: "The process of development in manufacturers creates a constant demand for new appliances, which the skill of ordinary head workmen and engineers is generally adequate to devise, and which, indeed, are the natural and proper outgrowth of such development. Each step forward prepares the way for the next, and each is usually taken by spontaneous trials and attempts in a hundred different places. To grant to a single party a monopoly of every slight advance made, except where the exercise of invention, somewhat above ordinary mechanical or engineering skill, is distinctly shown, is unjust in principle and injurious in its consequences.

"The design of the patent laws is to reward those who make some substantial discovery or invention, which adds to our knowledge and makes a step in advance in the useful arts. Such inventors are worthy of all favor. It was never the object of those laws to grant a monopoly for every trifling device, every shadow of a shade of an idea, which would naturally and spontaneously occur to any skilled mechanic or operator in the ordinary progress of manufacture. Such an indiscriminate creation of exclusive privileges tend rather to obstruct than to stimulate invention. It creates a class of speculative schemers who make it their business to watch the advancing wave of improvement, and gather its foam in the form of patented monopolies, which enable them to lay a heavy tax upon the industry of the country, without contributing anything to the real advancements of the arts. It embarrasses the honest pursuit of business with fears and apprehensions of concealed liens and unknown liabilities to lawsuits and vexations accounting for profits in good faith." (67 Lawyers Ed. 525.)

Garage Company Liable for Negligence of Their Mechanic While Making Test, Though Under Direction of Owner

A garage keeper in New York has just been held liable for the negligence of his mechanic in a trial test of a truck. The mechanic had put an Oldsmobile engine on an Alco truck and this was being tested to enable the owners to determine whether they were satisfied with the work of the garage company. Not satisfied with the test with an empty truck, the garage company was requested to try it with a load of ice for the owners. The mechanic who put the truck together was sent to drive it in this test. The owner of the truck instructed the mechanic where to get the ice and went with him, giving instructions.

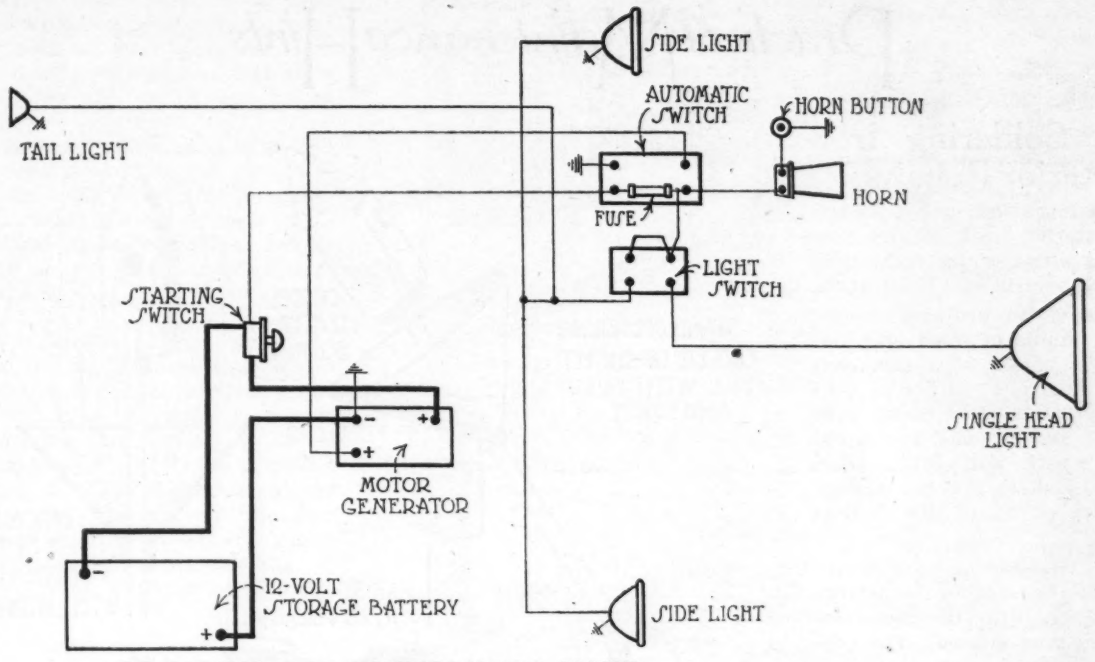
The mechanic evidently lost control of the loaded truck, for it crashed into two automobiles. Suit for damages was brought against the garage company for negligence of its mechanic in driving the truck. The case was dismissed by the trial court on the ground that the mechanic was engaged in the business of the truck owner at the time of the accident, being under his direction and control. However, this judgment has been reversed on appeal. The court said that the garage company, having performed work on the truck, in directing its mechanic to operate it to determine whether it worked properly, was liable for his negligence while making the test, though the accident occurred while on a trip for the truck owners who directed him where to deliver a load.

MEXICAN OIL LAWS IN DOUBT

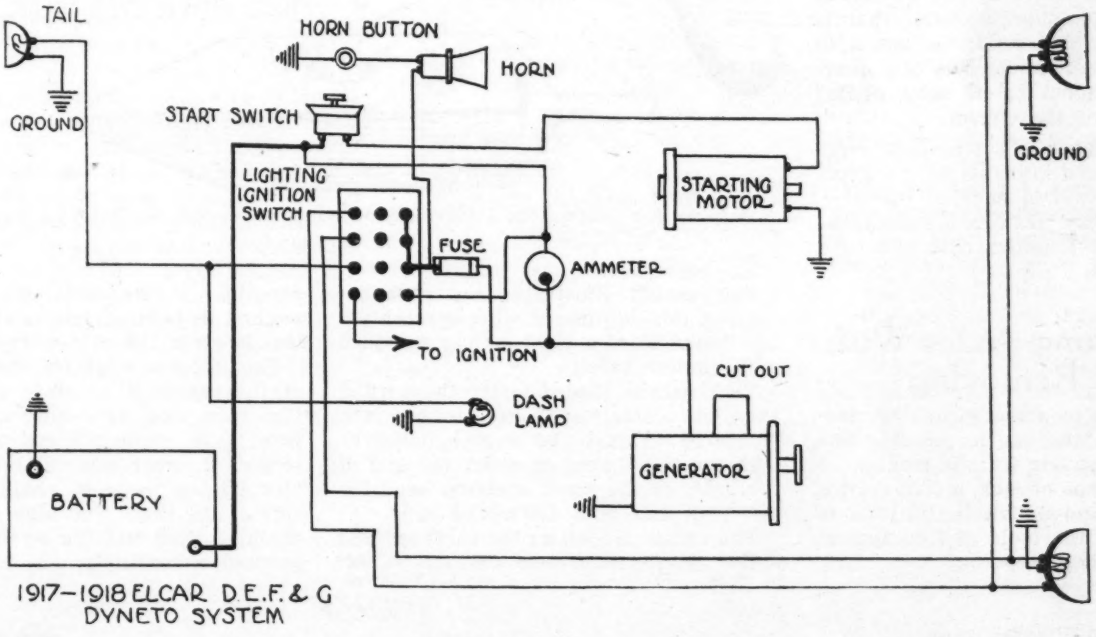
Washington, April 3—The status of petroleum legislation in Mexico is uncertain, according to reports received by the Bureau of Foreign and Domestic Commerce, and in the meantime producers are hampered by the uncertainty and hesitate to extend their operations.

On December 9, 1919, a petroleum law was passed by the Mexican Senate but before it becomes effective it must, of course, be passed by the Chamber of Deputies and signed by the President. It is unlikely that a special session of Congress will be called and the next session will take place on September 1. Permits to drill wells have been granted companies by a recent decree.

Motor Age Weekly Wiring Chart No. 76



1915 BRISCOE -B15- SPLITDORF-APELCO SYSTEM



1917–1918 ELCAR D.E.F. & G DYNETO SYSTEM

THIS WEEK

1917-1918 Elcar

1915—Briscoe

Allen—Dec. 18, '19
Auburn—Nov. 27, '19; April 1, '20
Cadillac—April 22, '20
Crow-Elkhart—April 22, '20
Chalmers—Nov. 27, '19
Cutting—Nov. 6, '19
Daniels—Dec. 4, '19
Davis—Dec. 4, '19
Dixie—April 1, '20
Dodge—April 15, '20
Dorris—Dec. 11, '19
Dort—March 25, '20
Essex—May 15-22, '19
Franklin—Dec. 11, '19
General Battery Charging—Sept. 25, '19
General Magneto Diagram—June 5, '19
Grant—April 29, '20
Internal Connections—July 10-17-24, '19
Keeton—Nov. 6,'19
Lexington—Jan. 1, '20
Liberty—Jan. 1, '20
Marmon—Dec. 25, '19; Jan. 22, '20
Mercer—Nov. 27, '19; March 25, '20
Mitchell—Jan. 8, '20
Moon—Jan. 29, '20; March 11, '20
Moore—March 4, '20
Nash—March 11, '20
National—Feb. 12, '20
Oakland—April 15, '20
Oldsmobile—April 8, '20
Olympian—Jan. 22, '20
Packard—March 18, '20
Paige—July 3, '19; April 29, '20
Pierce-Arrow—Feb. 5, '20
Pilot—March 4, '20
Premier—Dec. 18, '19; Feb. 26, '20
Reo—Nov. 13, '19
Roamer—March 18, '20
Saxon—April 8, '20
Scripps-Booth—Jan. 15, '20
Stearns-Knight—Jan. 8, '20
Stephens—Feb. 12, '20
Studebaker—Dec. 25, '19
Stutz—Feb. 5, '20
Templar—Jan. 29, '20
Velie—Feb. 19, '20
Westcott—Jan. 15, '20
White—Feb. 19, '20
Willys-Knight—Feb. 26, '20
Special Systems for Fords—May 15-22, '19

The Automotive Repair Shop

Practical Maintenance Hints

Improved Soldering Iron for Exterior Repairs

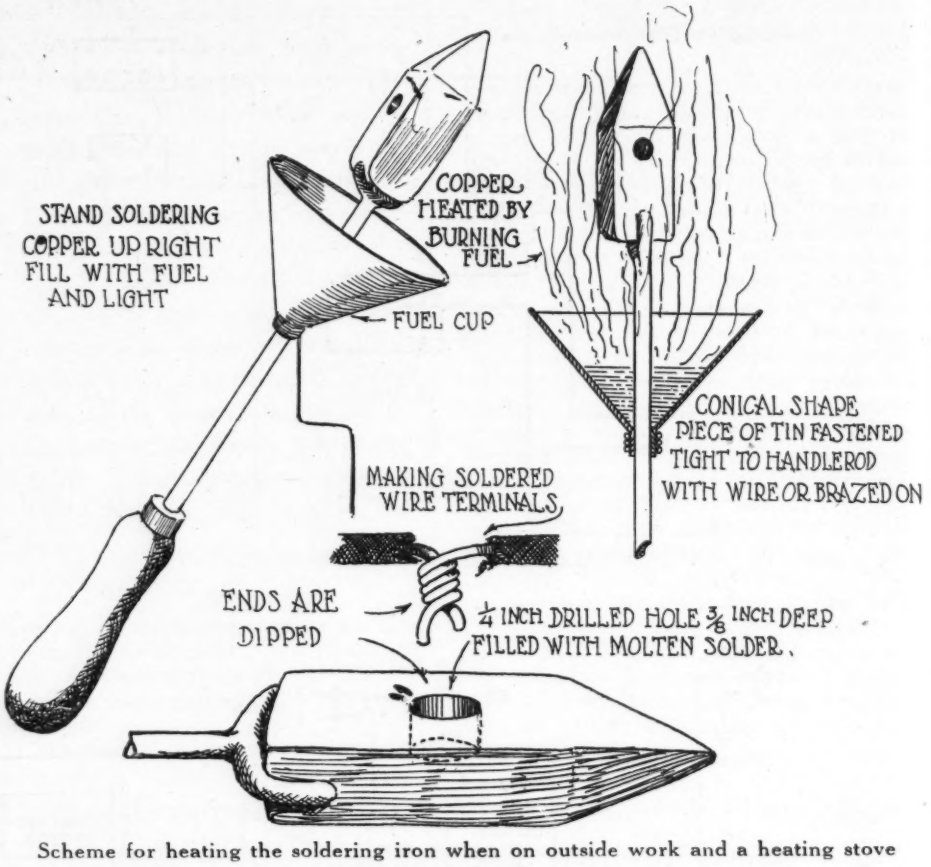
A method that provides a hot soldering iron for exterior work at any time when a heating stove is not convenient to have, is as shown in the illustration.

This consists of an ordinary copper with the usual handle of wood and iron bar, having an addition of a fuel container. This feature is either a portion of a funnel or a piece of tin bent to a cone shape, and attached to the rod of the copper with soft brass wire, twisted tight enough to prevent leakage of liquid or brazed on if this method is preferred.

To heat the iron either a small quantity of gasoline or alcohol is poured into the container, with the iron setting upright and then ignited. The copper will get serviceably hot in a very few minutes.

For electrical work where the terminals of electric wires are to be tinned and soldered together, a detail that is convenient and can easily be added to the above suggestion, consists of a quarter inch hole about ⅜ in. deep, drilled into one side of the copper.

When the copper is hot a small piece of solder is placed into this hole, making a dip for the twisted ends of the wire. The molten solder insures a substantial and permanent junction with the least effort and time.


STAND SOLDERING COPPER UP RIGHT FILL WITH FUEL AND LIGHT
COPPER HEATED BY BURNING FUEL
FUEL CUP
CONICAL SHAPE PIECE OF TIN FASTENED TIGHT TO HANDLEROD WITH WIRE OR BRAZED ON
MAKING SOLDERED WIRE TERMINALS
ENDS ARE DIPPED
¼ INCH DRILLED HOLE ⅜ INCH DEEP FILLED WITH MOLTEN SOLDER.

Scheme for heating the soldering iron when on outside work and a heating stove is not handy

Straightening Axles Without Removing

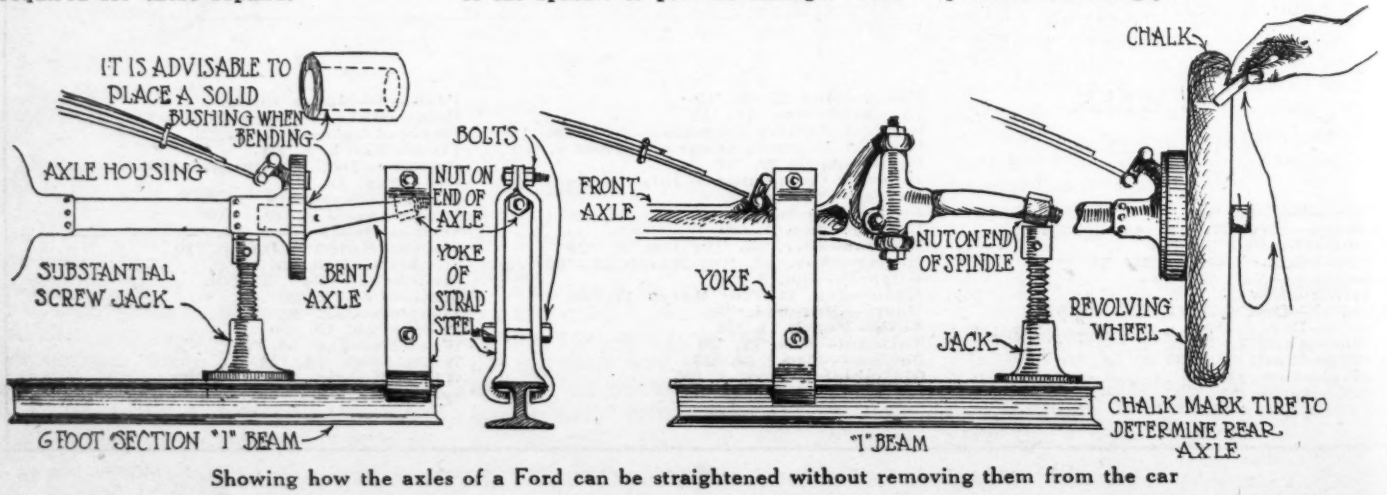
Straightening of axles without removing them from the car is possible and a considerable saving in time results. A rugged screw type of jack, a 6 ft. section of 5-in. "I" beam and a brace yoke of strap steel are the tools and equipment required for these repairs.

The sketch illustrates the arrangement of this equipment when straightening the axles of a Ford, or car provided with similar axles.

The beam is placed under the sprung axle, transversely with the car, the jack is placed against the axle housing or with the front member under the end of the axle, as the most common bend for the front axle is a downward bend.

The nut is placed on the threaded end of the spindle to prevent damage. Cold bending of the axle is the correct method as heating affects the tempering that is given the axle at the factory.

The simplest test for the correctness of the repair is to place the wheel on the axle, and spin the wheel on the front axle, while the engine is started, to turn the rear axle. If the wheel wobbles hold a piece of chalk against the side of the tire. The high spots will be chalk marked and the straightening can proceed accordingly.



Showing how the axles of a Ford can be straightened without removing them from the car

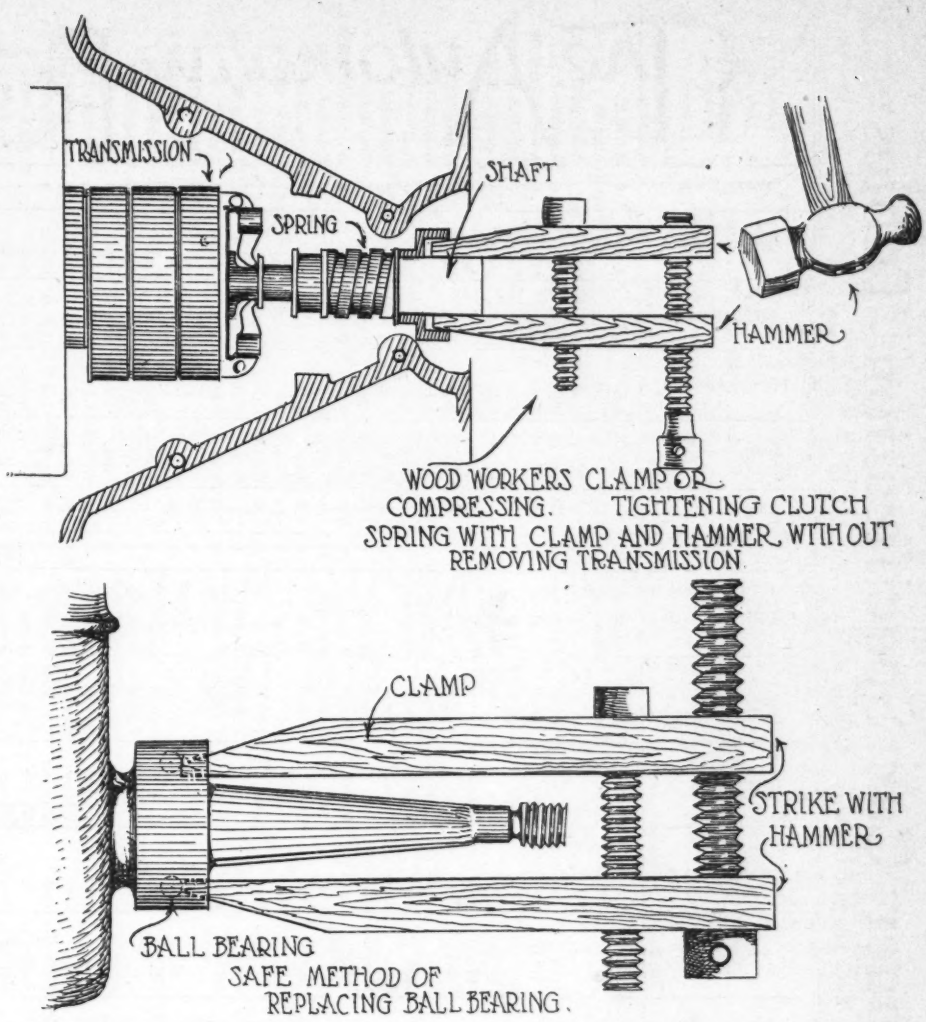
Clamp for Clutch Springs and Bearings

A method a repairman uses in assembling Ford clutch springs and similar springs in other cars, is as good as it is simple. A substantial wood worker's clamp is screwed up as tight as can be done safely on the transmission shaft after the spring and collar are put on.

With a hammer the clamp is driven forward, closing the spring up. The friction of the ends of the clamp against the shaft prevents the spring from opening up. When the clutch spring is compressed the desired distance the retaining pin, holding the spring collar is put in place.

A weak or broken clutch spring can be renewed in this manner without taking the engine from the chassis. The same wooden type of clamp is a safe tool for driving ball thrust or radial bearings into place on shafts or axles.

The nose of the clamp is placed against the ball bearing and the butt of the clamp struck with the hammer. This prevents injury to the bearing, as is frequently done when struck directly with the hammer.



Woodworker's clamp for clutch spring and bearings used by Ford repairman

Crow Bridge to Expedite Drilling

The sketch shows a drilling crow or old man as it is sometimes called, rigged up from a lathe dog and a bent bar of iron.

The purpose of this feature is to support one end of the ratchet drill when boring holes in car frames, bodies or other inaccessible parts of the car.

These two parts comprising this drilling crow are usually available and their use will be found more satisfactory than most any improvised arrangement of blocks and supports that usually upset several times before the hole is drilled.

The set screw in the lathe dog allows of adjusting the length, to suit most any conditions. A center hole in the end of the dog and one in the end of the bar makes the drill support reversible, so that the projecting bar will not interfere with adjacent parts of the car.

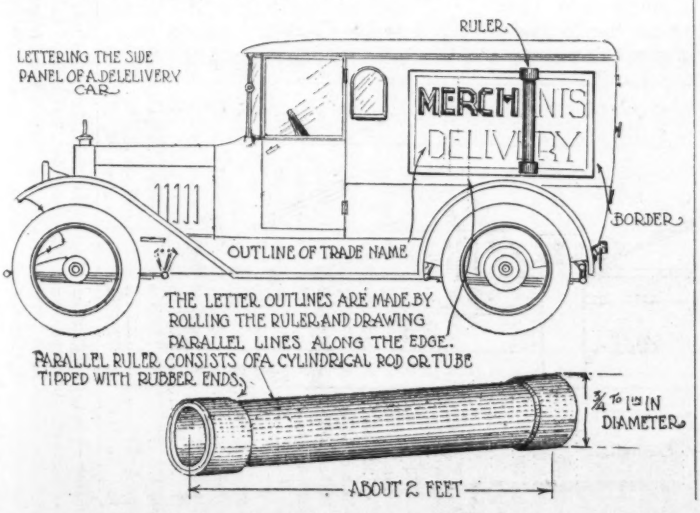
Roller Ruler for the Painter

A simple arrangement of parallel ruler, convenient for lettered painting on bodies of delivery cars or cars for business purposes, is shown in the sketch.

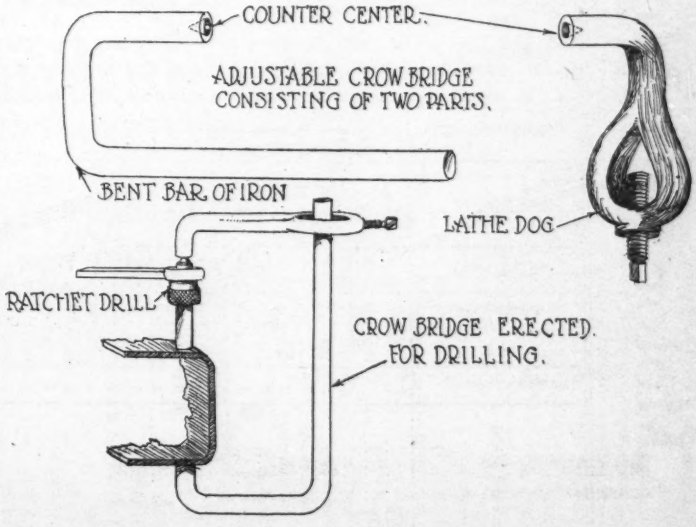
This lettering rules consists of a straight brass tube, or a wooden rod three-quarters to an inch in diameter. A piece of rubber tubing at each end provides against the ruler slipping on the painted surface.

In use the rod ruler is rolled across the panel of the car body and chalk or pencil lines are drawn for the outlines of the lettering or the border. The ruler can either be rolled horizontally or vertically and the lines drawn along the sides will be uniformly parallel.

The device is simple to use and will enable the most incompetent painter to make presentable lettering work.


RULER
LETTERING THE SIDE PANEL OF A DELELIVERY CAR
MERCH NTS
DELIVERY
BORDER
OUTLINE OF TRADE NAME
THE LETTER OUTLINES ARE MADE BY ROLLING THE RULER AND DRAWING PARALLEL LINES ALONG THE EDGE.
PARALLEL RULER CONSISTS OF A CYLINDRICAL ROD OR TUBE TIPPED WITH RUBBER ENDS
¾ TO 1 1/4 IN DIAMETER
ABOUT 2 FEET

Parallel ruler for ruling lines to guide lettering on bodies



Crow bridge to assist drilling in inaccessible places

Motor Age Monthly Passenger Car Specification Tables

These prices apply to five and seven-passenger models only.

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. C. HP.	Carbureter Size and Make	Gear Ratio	Clutch	Gearset	Universals	Rear Axle	Steering Gear	Speedometer	Rims	Battery Volts	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model
Ace T. L.	5	2050	115	32x4	Firestone	3½x5	H-S	6	25.35	1¼—Strom.	4.50	Detlaff	Warner	Detroit	Spacke	Gemmer	Stewart	Firestone	6	170	U. S. L.	A-L	A-L	A-K	6	Ace T. L
Allen 43	5	1495	110	32x4	Miller	3½x5	Own	4	19.6	1 —Strom.	4.63	B. and B.	Own	Detroit	Columbia	Ditweiler	Stewart	Firestone	6–8	90	U. S. L.	West.	West.	.....	6–8	Allen 43
American C	7	2350	127	32x4	.....	3½x5	H-S	6	25.35	1½—Strom.	.....	.....	.....	.....	Salisbury	.....	.....	.....	.....	.....	.....	G. & D.	G. & D.	Conn.	.....	American C
American Beauty	5	2450	121	33x4	Firestone	3½x5	H-S	6	25.35	1½—Ray.	4.90	B. and B.	Detroit	Acme	Timken	Standard	Warner	Firestone	6	110	Willard	West.	West.	A-K	6	American Beauty
Anderson Series 30	7	....	120	33x4	Goodrich	3½x4½	Cont.	6	25.35	Ray.	4.50	B. and B.	Durston	Ther-H	Salisbury	Jacox	Stewart	Firestone	6	90	Willard	Remy	Remy	Remy	6	Anderson Series 30
Apperson Anniversary	7	4250	130	34x4½	U. S.	3½x5	Own	8	33.80	1¼—John.	4.25	Own	Own	Sterling	Own	Own	V. Sicklen	Firestone	6	110	Willard	Bijur	Bijur	Remy	6	Apperson Anniversary
Apperson 8-20	7	3250	130	34x4½	Goodyear	3½x5	Own	8	33.80	1¼—John.	4.25	Own	Own	Sterling	Own	Own	V. Sicklen	Firestone	6	110	Willard	Bijur	Bijur	Remy	6	Apperson 8-20
Argonne	4	4750	128	32x4	Goodrich	3½x5½	Own	4	22.50	—Ray.	.....	Own	Own	Opt.	Stan-Par	Gemmer	Waltham	Houk	12	15	Exide	West.	Own	Eise.	12	Argonne
Auburn 6-39	5	1895	120	33x4	Goodrich	3½x4½	Cont.	6	25.35	1—Ray.	4.66	B. and B.	G-L	Hartford	Col.	Jacox	Stewart	Firestone	6	80	Willard	Remy	Remy	Remy	6	Auburn 6-39
Beggs 6	5	1935	120	33x4	Goodrich	3½x4½	Cont.	6	25.35	1—Strom.	.....	B. and B.	Detroit	Arvac.	Stan-Par	Ditweiler	Stewart	Firestone	6	100	Exide	A-L	A-L	Conn.	6	Beggs 6
Bell	5	1495	114	31x4	Miller	3½x4½	C. B. & S.	4	22.50	1—Strom.	.....	.....	Muncie	Hart	Peru	Warner	Stewart	Firestone	6	.....	Prest.	A-L	.....	A-K	6	Bell
Biddle B-5	6	3950	125	32x4	Firestone	3½x5½	Buda	4	22.50	1½—Zen.	4.50	Warner	Warner	Spicer	Stan-Par	Gemmer	Warner	.....	6	90	Phila.	G. & D.	G. & D.	Simms	6	Biddle B-5
Bour Davis 20	5	1800	118	32x4	Goodyear	3½x4½	Cont.	6	25.35	1—Strom.	4.75	B. and B.	Detroit	Mehanics	Salisbury	C. A. S.	Stewart	Perlman	6	115	Willard	Remy	Remy	Remy	6	Bour-Davis 20
Bour-Davis 21 S. & R.	7	2585	126	33x4½	Goodyear	3½x5½	Cont.	6	29.40	1½—Zen.	4.50	Muncie	Muncie	Spicer	Salisbury	Lavine	Stewart	Firestone	6	115	Willard	West.	West.	West.	6	Bour-Davis 21 S. & R.
Brewster	4	9000	125	34x4½	Kelly-S	4x5½	Own	4	25.60	1½—Strom.	4.50	Own	Own	Own	Own	Own	Stewart	Hayes	6	80	Prest.	A-L	A-L	Conn.	6	Brewster
Briscoe 4-34	5	1185	109	31x4	optional	3½x5	Own	4	18.23	1—Buick #	4.18	Own	Own	Own	Own	Own	Stewart	Hayes	6	80	Prest.	A-L	A-L	Conn.	6	Briscoe 4-34
Buick K-6-45	5	1595	118	33x4	Goodyear	3½x4½	Own	6	27.34	—Mar.	4.00	Own	Own	.....	Own	Own	A-C	Own	6	80	Willard	Delco	Delco	Delco	6–8	Buick K-6-45
Buick K-6-49	7	1865	124	34x4½	Goodyear	3½x4½	Own	6	27.34	—Mar.	4.00	Own	Own	.....	Own	Own	A-C	Own	6	80	Willard	Delco	Delco	Delco	6–8	Buick K-6-49
Cadillac 59	7	3740	132	35x5	optional	3½x5½	Own	8	31.25	1½—Own*	5.08	Own	Own	Spicer	C-Timk.	Own	V. Sicklen	Kelsey	6	.....	Exide	Delco	Delco	Delco	6–3	Cadillac 59
Case V	7	2650	126	34x4½	Goodyear	3½x5½	Cont.	6	29.40	1½—Ray.	4.45	B. and B.	G-L	Arco	Col.	Jacox	V. Sicklen	Firestone	6	118	Willard	West.	West.	Delco	6	Case V
Chalmers 35-C	5	1795	117	32x4	optional	3½x4½	Own	6	25.35	.....	.....	Own	Own	.....	.....	Own	.....	.....	6	106	.....	.....	.....	.....	6	Chalmers 35-C
Chalmers 35-B	7	1945	122	33x4½	optional	3½x4½	Own	6	25.35	.....	.....	Own	Own	.....	.....	Own	.....	.....	6	106	.....	.....	.....	.....	6	Chalmers 35-B
Champion C-4	5	1250	116	32x3½	Goodrich	3½x5	Lyco	4	19.60	1—Zen.	4.25	B. and B.	G-L	.....	Peru	C. A. S.	Stewart	Stanweld	6	.....	Willard	Delco	Delco	Delco	6	Champion C-4
Champion S-4	5	1395	118	32x4	Goodrich	3½x5	H-S	4	19.60	1—Carter	4.25	B. and B.	G-L	.....	Peru	C. A. S.	V. Sicklen	Stanweld	6	.....	Prest.	Dyn.	Dyn.	A-K	6	Champion S-4
Chandler	7	1895	123	33x4	Goodrich	3½x5	Own	6	29.40	1½—Ray.	4.40	B. and B.	Own	Hartford	Own	Gemmer	Stewart	Firestone	6	120	Prest.	G. & D.	G. & D.	Bosch	6	Chandler
Chevrolet 4-90	5	795	102	31x4	Goodyear	3½x4	Own	4	21.76	1½—Zen. #	3.63	Own	Own	Own	Own	Warner	Stewart	Perl-Jack.	6	80	Willard	A-L	A-L	Simms	6	Chevrolet 4-90
Chevrolet F. B.	5	1295	110	33x4	Goodyear	3½x5¾	Own	4	27.10	1½—Zen.	4.62	Own	Warner	Own	Own	Warner	Stewart	Perl-Jack.	6–8	120	Willard	A-L	A-L	Simms	6	Chevrolet F. B.
Cleveland 40	5	1385	112	32x4	Goodrich	3x4½	Own	6	21.60	1—Strom.	4.45	B. and B.	Mechanics	Mechanics	Own	Ditweiler	V. Sicklen	Firestone	6	94	Prest.	G. & D.	G. & D.	Bosch	6	Cleveland 40
Climber 4	5	....	117	33x4	.....	3½x5	H-S	4	19.60	—Strom.	4.80	B. and B.	B-L	Hartford	.....	Warner	V. Sicklen	Jacox	.....	.....	.....	West.	West.	A-K	.....	Climber 4
Climber 6	7	....	120	33x4½	.....	3½x5	Cont.	6	25.35	—Strom.	4.75	B. and B.	B-L	Hartford	Timken	Warner	V. Sicklen	Firestone	.....	.....	.....	West.	West.	A-K	.....	Climber 6
Cole Aero Eight 870	7	2850	127	33x5	Firestone	3½x4½	North.	8	39.20	1½—John.	4.45	North.	North.	Spicer	Col.	Gemmer	Warner	Firestone	6	50	Prest.	Delco	Delco	Delco	6	Cole Aero Eight 870
Columbia C	5	1895	115	32x4	Firestone	3½x4½	Cont.	6	25.35	1½—Strom.	4.75	B. and B.	Durston	Spicer	Timken	Gemmer	Stewart	Firestone	6	105	Prest.	A-L	A-L	A-K	6	Columbia C
Comet C-53	5	2350	125	33x4½	Firestone	3½x5½	Cont.	6	29.40	1½—Strom.	4.66	B. and B.	Muncie	Arvac	Col.	Gemmer	Stewart	Firestone	6	120	Willard	Wagner	Wagner	Wagner	6	Comet C-53
Commonwealth 4-40	5	1495	117	32x4	Goodrich	3½x5	Lyco.	4	19.60	1—Carter	4.25	B. and B.	G-L	Detroit	Peru	C. A. S.	V. Sicklen	Stanweld	6	105	Prest.	Dyn.	Dyn.	A-K	6	Commonwealth 4-40
Crawford 20-6-40	7	3000	122½	32x4	.....	3½x5½	Cont.	6	29.40	—Strom.	.....	.....	.....	.....	Timken	Gemmer	.....	Firestone	.....	.....	.....	.....	West.	Bosch	.....	Crawford 20-6-40
Crow-Elkhart L-55-4	5	1395	117	32x3½	Firestone	3½x5	Lyco.	4	19.60	⅞—Zen.	.....	B. and B.	Covert	Ther-H	Peru	Ditweiler	Stewart	Jaxon	6	80	Exide	Dyn.	Dyn.	Conn.	6	Crow-Wlkhart L-55-4
Crow-Elkhart H-55-6	5	1645	117	33x4	Firestone	3½x5	Ruten.	6	23.4	—Zen.	.....	B. and B.	Covert	Ther-H	Peru	Ditweiler	Stewart	Jaxon	6	80	Exide	Dyn.	Dyn.	Conn.	6	Crow-Elkhart H-55-6
Cunningham V-4	7	....	142	35x5	optional	3½x5	Own	8	45.00	1½—Strom.	4.08	B-L	Own	Snead	Timken	Gemmer	Warner	Firestone	6	120	Willard	Delco	Delco	Delco	6	Cunningham V-4
Daniels D	7	4850	132	34x4½	optional	3½x5½	Own	8	39.20	1¼—Zen.	4.40	Own	Own	Spicer	Timken	Gemmer	Stewart	Firestone	6	145	Willard	Delco	Delco	Delco	6	Daniels D
Davis 51	5	2185	120	33x4	.....	3½x4½	Cont.	6	25.35	1½—Strom.	4.75	B. and B.	Warner	Peters	Timken	Warner	Stewart	Firestone	6	80	Willard	Delco	Delco	Delco	6	Davis 51
Dixie Flyer H-S-70	5	1465	112	32x4	Fisk	3½x5	H-S	4	19.60	1—Strom.	4.72	B. and B.	G-L	Ther H	Peru	C. A. S.	V. Sicklen	Standard	6	80	Willard	Dyn.	Dyn.	Eise.	6	Dixie Flyer H-S-70
Dodge Brothers	5	1085	114	32x3½	optional	3½x4½	Own	4	24.03	1⅛—Stew.	4.16	Own	Own	Own	Own	Own	J. Man.	Kelsey	12	50	Willard	N. E.	.....	Own	12	Dodge Brothers
Dorris 6-80	7	4350	132	33x5	Goodyear	4x5	Own	6	38.40	1½—Strom.	3.50	Warner	Warner	Spicer	Timken	Ross	V. Sicklen	Firestone	6	130	Willard	West.	West.	Bosch	6	Dorris 6-80
Dort 15	5	1035	105½	30x3½	Goodyear	3½x5	D-Lyco	4	19.60	1—Carter	4.07	Own	Mechanics	Mechanics	Flint	Jacox	Stewart	Cleveland	6	95	U. S. L.	West.	West.	Conn.	6	Dort 15
du Pont A	5	4000	124	32x4½	Goodrich	3½x5½	Own	4	24.75	1½—Strom.	4.45	B-L	B-L	Spicer	Col.	Jacox	Stewart	Firestone	6	105	Exide	West.	West.	Eise.	6	du Pont A
Economy 6-46	5	1895	115	33x4	Goodrich	3½x4½	Cont.	6	25.35	1—Zen.	4.50	B. and B.	Durston	Norwalk	Salisbury	Ditweiler	Stewart	Firestone	6	90	Willard	A-L	A-L	Conn.	6	Economy 6-46
Elcar 6	5	1795	116	33x4	Firestone	3½x4½	Cont.	6	25.35	1½—Strom.	4.50	B. and B.	Muncie	Peters	Salisbury	C. A. S.	Stewart	Stanweld	6	90	Willard	Delco	Delco	Delco	6	Elcar 6

Engines—Ruten., Rutenber; Cont., Continental; Weid., Weidely; North., Northway; H-S., Herschell-Spillman; Lyco., Lycoming; D-Lyco., Dort-Lycoming; G. B. & S., Golden, Belknap & Swartz; T-McTeetor-McFarlan; #, Monson or Duesenberg; R. & V., Root & Van Dervoort. **Carburetor**—Strom., Stromberg; Zen., Zenith; Ray., Rayfield; John., Johnson; Mar., Marvel; Sund., Sunderman; Stew. Stewart; H-K., Holley-Kingston; Newc., Newcomb; Scheb., Schebler; Tillot., Tillotson; Johns., Johnston. Fuel feed vacuum except where otherwise indicated. *Pressure. #Gravity. **Generator and Motor**—A-L., Auto-Lite; West., Westinghouse; #, Westinghouse or Auto-Lite; W-L., Ward-Leonard; Dyn., Dyneto; N. E., North East; L-N., Leece-Neville; A-C., Allis-Chalmers; Split., Splitdorf; S-H., Simms-Huff; G. & D., Gray & Davis. **Ignition**—A-K., Atwater-Kent; Conn., Connecticut; Eise., Eisemann; West., Westinghouse; Will., Willard; N. E., North East; K-Remy, Kingston-Remy; Berl., Berling; Bosch-W., Bosch-Westinghouse; Split., Splitdorf. **Gearset**—G-L., Grant-Lees; North., Northway; B-L., Brown-Lipe. **Rear Axle**—Col., Columbia; W-Weiss, Walker-Weiss; C-Timk., Cadillac-Timken; West-Mott, Weston-Mott. **Universals**—Hart., Hartford; Ther-H., Thermoid-Hardy; U. M. Co., Universal Machine Co. **Speedometer**—J-Man., Johns-Manville; V-Sicklen, Van Sicklen; A-C., Allis-Chalmers.

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. C. HP.	Carbureter Size and Make	Gear Ratio	Clutch	Gearset	Universals	Rear Axle	Steering Gear	Speedometer	Rims	Battery Volts	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model
Elcar 4	5	1495	116	33x4	Firestone	3½x5	Lyco.	4	19.60	1—Strom.	4.50	B. and B.	Muncie	Peters	Salisbury	C. A. S.	Stewart	Stanweld	6	90	Willard	Delco	Delco	Delco	6	Elcar 4
Elgin Series K	5	1665	118	33x4	optional	3½x4¼	Falls	6	23.44	1—Strom.	5.09	B. and B.	Mechanics	Col.	Col.	C. A. S.	V. Sicklen	Firestone	6	90	Willard	Wagner	Wagner	Wagner	6	Elgin Series K
Essex A	5	1545	108½	32x4	optional	3½x5	Own	4	18.23	1¼—Own	5.09	Own	Own	Timken	Timken	Gemmer	Stewart	Kelsey	6	105	Exide	Delco	Delco	Delco	6	Essex A
Fergus	6	....	126	32x4	.....	3½x5	.....	6	25.35	—Zen.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Bijur	Bijur	Delco	....	Fergus
Ferris	6	3390	130	32x4½	Firestone	3½x5½	Cont.	6	29.40	—Zen.	.....	B. and B.	G-L	Peters	Col.	Gemmer	Warner	Firestone	6	120	Willard	L-N	Bijur -N	L-N	6	Ferris
Fiat	7	....	136	35x5	.....	.....	Own	6	.....	—Own	4.75	.....	Own	Own	Own	Own	Stewart	.....	12	60	Own	Own	Own	Marelli	....	Fiat
Ford T	5	575	100	30x3½	.....	3¾x4	Own	4	22.50	1—H-K#	3.63	Own	Own	Own	Own	Own	Ditweiler	Stewart	12	60	None	Own	Own	Own	6	Ford T
Franklin 9-B	5	2850	115	32x4	Goodyear	3¼x4	Own	6	25.35	1—Own	4.33	B. and B.	Own	Own	Own	Own	Stewart	Jaxon	6	80	None	Own	Own	Own	12	Franklin 9-B
Gardner	5	1125	112	32x3½	Goodyear	3½x5	Own	4	19.60	1—Carter	.....	B. and B.	Mechanics	W-Weiss	W-Weiss	C. A. S.	Stewart	Firestone	12	60	Willard	Dyn.	West.	West.	15	Gardner
Geronimo	5	1995	122	32x4	Goodyear	3½x5	Ruten.	6	23.44	1—Strom.	.....	B. and B.	G-L	Peters	Flint E	Jacox	V. Sicklen	Firestone	6	87	Willard	West.	Dyn.	Dyn.	6	Geronimo
Grant H-X	5	1595	116	32x4	optional	3 1/16x4½	Walker	6	22.52	1—Strom.	4.63	B. and B.	Durston	Hart	Columbia	Gemmer	Stewart	Kelsey	6	88	Willard	Dyn.	Bijur	A-K	6	Grant H-X
Hanson 54-A	5	2165	119	32x4	optional	3¼x4½	Cont.	6	25.35	1¼—Mar.	.....	B. and B.	Covert	Spicer	Timken	Lavine	Stewart	Stanweld	6	80	Prest.	Delco	Delco	Delco	6-8	Hanson 54-A
Harroun A-A-2	5	995	106	30x3½	Miller	3¼x5½	Own	4	16.90	1—Strom.	4.00	Own	G-L	Detroit	Adams	Barnes	.....	.....	6	80	Prest.	Remy	Remy	Remy	6	Harroun A-A-2
Harvard 4-20	2	850	100	28x3	.....	3x4½	.....	4	14.40	¾—Zen.#	.....	.....	.....	Own	Own	.....	Stewart	Firestone	6	....	Nat'l	Wagner	Wagner	A-K	6-3	Harvard 4-20
Hatfield A-42	5	1695	115	32x4	Firestone	3¼x5	H-S	4	16.90	1—Zen.	.....	B. and B.	G-L	Blood	Col.	Col.	Warner	Houk	6	....	Willard	Dyn.	L-N	Conn.	6	Hatfield A-42
Haynes 46	7	3450	127	34x4½	optional	2¾x5	Own	12	36.30	1½—Ray.	4.07	B. and B.	Own	Spicer	Own	Jacox	Stewart	Firestone	6	120	Willard	L-N	L-N	Delco	6	Haynes 46
Haynes 45	7	2685	127	34x4½	optional	3½x5	Own	6	29.40	1¼—Ray.	4.42	B. and B.	Own	Arvac	Arvac	Jacox	.....	.....	.....	.....	.....	.....	.....	King	6	Haynes 45
H. C. S. Special	4	2950	120	32x4½	Goodrich	3½x5½	Weid.	4	21.03	.....	.....	.....	.....	.....	Own	.....	Warner	Firestone	6	80	U. S. L.	Delco	.....	Delco	....	H. C. S. Special
Hollier 206-B	5	1985	120	33x4	Goodrich	3¼x4½	Cont.	6	25.35	1—Zen.	4.41	Fuller	Fuller	Own	Timken	Gemmer	V. Sicklen	Firestone	12	100	Willard	Dyn.	West.	West.	6	Hollier 206-B
Holmes	7	3100	126	34x4½	Goodyear	3¼x4½	Cont.	6	29.40	1—Newc.	4.90	B-L	B-L	Spicer	Timken	Gemmer	Stewart	Kelsey	6	105	Exide	Delco	Dyn.	Eise.	12	Holmes
Hudson O	7	3400	125	34x4½	optional	3¼x5	Own	6	29.40	1½—Own	4.45	Own	Own	Spicer	Timken	Gemmer	Stewart	Firestone	12	90	Willard	Dyn.	Delco	Delco	6	Hudson O
Huffman W	5	1895	120	32x4	Firestone	3¼x4½	Cont.	6	25.35	.....	.....	B. and B.	Covert	.....	Salisbury	Ditweiler	Stewart	Firestone	6	90	Willard	West.	West.	A-K	6	Huffman W
Hupmobile R-4	5	1550	112	32x4	Goodyear	3¼x5½	Own	4	16.90	1—Strom.	4.87	Own	Own	Detroit	Own	Jacox	V. Sicklen	Kelsey	6	90	Willard	West.	West.	Remy	6	Hupmobile R-4
Jackson 6-38	5	....	121	33x4	Goodyear	3¼x4½	Cont.	6	25.35	1—Strom.	.....	B and B.	Covert	Detroit	Salisbury	C. A. S.	Stewart	Jaxon	6	94	U. S. L.	A-L	A-L	A-L	6	Jackson 6-38
Jones 28	7	2250	126	34x4	Goodrich	3½x5½	Cont.	6	29.40	1¼—Ray.	4.50	B. and B.	G-L	Arvac	Stan-Par	Gemmer	V. Sicklen	Firestone	6	120	Prest.	A-L	A-L	A-L	6	Jones 28
Jordan F	7	2975	127	32x4½	Goodyear	3½x5½	Cont.	6	29.40	1½—Strom.	4.08	Detroit	Detroit	Spicer	Timken	Gemmer	V. Sicklen	Firestone	6	118	Willard	Delco	Delco	Delco	6	Jordan F
Jordan M	5	2650	120	32x4	Goodyear	3¼x4½	Cont.	6	25.35	1¼—Strom.	4.66	Detroit	Detroit	Spicer	Timken	Gemmer	V. Sicklen	Firestone	6	94	Willard	Delco	Delco	Delco	6	Jordan M
Kenworthy 6-55	5	3900	130	32x4½	optional	3¼x5½	Cont.	6	29.40	—Strom.	4.10	B-Lipe	B-Lipe	Ther-H	Col.	Ross	Warner	.....	6	140	Exide	West.	West.	Bosch	6	Kenworthy 6-55
King H	7	2585	120	32x4½	optional	3x5	Own	8	28.80	1½—Ball	4.08	Detroit	Own	Ther-H	Col.	Jacox	V. Sicklen	Standard	6	120	Prest.	West.	West.	.....	6	King H
Kissel	7	3175	124	32x4½	Goodyear	3 1/16x5½	Own	6	26.75	1¼—Strom.	4.25	Warner	Warner	Spicer	Col.	Jacox	Stewart	Firestone	6	120	Willard	Remy	Remy	Remy	6	Kissel
Klinekar 6-55-J	5-7	2090	121	33x4	Goodyear	3¼x4½	Cont.	6	25.35	1¼—Ray.	4.50	B. and B.	G-L	Flexite	Standard	Jacox	Stewart	Firestone	6	90	Prest.	Wagner	Delco	Remy	6	Klinekar 6-55-J
LaFayette	7	....	132	33x5	Firestone	3¼x5½	Own	8	33.80	2—Own*	.....	Own	Own	Own	Own	Wohlrab	Stewart	Firestone	6	....	Exide	Delco	Delco	Delco	6-8	LaFayette
Leach	5-7	4900	126½	32x4½	Goodyear	3¼x5½	Cont.	6	29.40	—Ray.	.....	B-L	B-L	Spicer	Standard	Liberty	Waltham	Firestone	6	180	Prest.	Delco	Delco	Delco	6-8	Leach
Lexington S-20	5	2185	122	32x4	optional	3¼x4½	Cont.	6	25.35	1½—Ray.	4.66	B. and B.	Warner	Hardy	Own	C. A. S.	.....	.....	6	100	Willard	G-D	G-D	Conn.	6	Lexington S-20
Liberty 10-C	5	1795	117	32x4	Goodyear	3¼x5	Own	6	23.44	1—Strom.	4.66	B. and B.	Detroit	Spicer	Timken	Gemmer	Stewart	Kelsey	6	90	Willard	Wagner	Wagner	Wagner	6	Liberty 10-C
Locomobile 48	7	8900	142	35x5	optional	4½x5½	Own	6	48.60	1½—Own*	3.80	Own	Own	Own	Standard	Gemmer	Stewart	Firestone	6	140	Exide	West.	West.	Berl.	6	Locomobile 48
Lorraine	5	1425	114	32x4	Republic	3½x5	H-S	4	19.60	1—John.	4.75	B. and B.	G-L	Acme	Peru	Bucyrus	Stewart	Stanweld	6	94	U. S. L.	West.	West.	A-K	6	Lorraine
Maibohm B	5	1495	116	32x4	Fisk	3¼x4½	Falls	6	23.44	1—Till.	4.50	B. and B.	Muncie	Flexite	Peru	Own	V. Sicklen	Stanweld	6	94	Willard	Bijur	Bijur	A-K	6	Maibohm B
Marmon 34	7	5000	136	32x4½	optional	3½x5½	Lyco.	6	33.75	1½—Strom.#	4.10	Own	Own	Spicer	Own	Gemmer	Stewart	Firestone	6	162	Willard	Delco	Delco	Delco	6	Marmon 34
Marshall K	5	1295	118	32x3½	Firestone	3½x5	Lyco.	4	19.60	1—Zen.	.....	B. and B.	G-L	Spicer	Own	Own	Stewart	.....	6	160	Willard	Dyn.	Dyn.	Dyn.	6	Marshall K
Maxwell 25	5	1055	109	30x3½	.....	3¾x4½	Own	4	21.03	1—.....	.....	Own	B-L	Spicer	Timken	Warner	Firestone	.....	12	80	Prest.	.....	.....	A-K	12	Maxwell 25
McFarland 127	7	5100	136	35x5	Goodrich	4½x6	T-McF	6	48.60	1½—Strom.	3.58	B. and B.	B-L	Spicer	Own	Gemmer	Warner	Firestone	6	120	Willard	West.	West.	Bos-W.	6	McFarland 127
Mercer Series 5	6	4950	132	32x4½	optional	3¾x6¾	Own	4	22.50	1½—Ball	3.87	Own	Own	.....	Standard	Gemmer	Warner	Firestone	6	182	Willard	West.	West.	Eise.	6	Mercer Series 5
Meteor K R	4	5000	129	32x4½	optional	4x6	Duesen.	4	25.60	1½—Zen.	4.41	B. and B.	B-L	Hart	Timken	Own	Stewart	.....	6	....	Willard	Bijur	Bijur	Simms	6	Meteor K R
Metz Master 6	5	1895	120	32x4	Goodrich	3½x5	Ruten.	6	23.44	1—Strom.	4.63	B. and B.	B-L	Own	Own	Own	Stewart	Firestone	6	110	Willard	West.	West.	Conn.	6	Metz Master 6
Mitchell F-40	5	1750	120	33x4	.....	3½x5	Own	6	25:35	1½—Ray.	4.41	B. and B.	B-L	Own	Stan-Par.	C. A. S.	Stewart	Stanweld	6	94	Willard	Remy	Remy	Remy	6	Mitchell F-40
Monitor M. & Ser. 3	5	2475	121	33x4	Miller	3¼x4½	Own	6	25.35	1—Strom.	.....	B. and B.	G-L	.....	.....	C. A. S.	Stewart	Firestone	6	94	Prest.	Dyn.	Dyn.	Conn.	6	Monitor M. & Ser. 3
Monroe S-9	5	1440	115	32x3½	Goodyear	3¼x4½	Cont.	4	16.90	1½—Zen.	4.50	Own	Muncie	Universal	Own	Warner	Stewart	Firestone	6	80	U. S. L.	A-L	A-L	A-L	6	Monroe S-9
Moon 6-48	5	2285	122	32x4	Miller	3¼x4½	Cont.	6	25.35	1½—Ray.	.....	B. and B.	B-L	Spicer	Timken	Warner	Stewart	Firestone	6	110	Exide	Delco	Delco	Delco	6	Moon 6-48
Moon 6-68	7	2750	125	32x4½	Miller	3½x5½	Cont.	6	29.40	1¼—Ray.	4.45	B. and B.	B-L	Spicer	Timken	Warner	Stewart	Firestone	6	110	Exide	Delco	Delco	Delco	6	Moon 6-68
Moore 30	5	1095	108	30x3½	Firestone	3x5	Own	4	14.40	1—Mar.	.....	Detlaff.	G-L	U. P.	Peru	Ditweiler	Stewart	Firestone	6	80	Willard	A-L	A-L	Conn.	6	Moore 30

Engines—Ruten., Rutenber; Cont., Continental; Weid., Weidely; North., Northway; H-S., Herschell-Spillman; Lyco., Lycoming; D-Lyco., Dort-Lycoming; G. B. & S., Golden, Belknap & Swartz; T-McTeetor-McFarlan; #, Monson or Duesenberg; R. & V., Root & Van Dervoort. **Carburetor**—Strom., Stromberg; Zen., Zenith; Ray., Rayfield; John., Johnson; Mar., Marvel; Sund., Sunderman; Stew. Stewart; H-K., Holley-Kingston; Newc., Newcomb; Scheb., Schebler; Tillot., Tillotson; Johns., Johnston. Fuel feed vacuum except where otherwise indicated. *Pressure. #Gravity. **Generator and Motor**—A-L., Auto-Lite; West., Westinghouse; #, Westinghouse or Auto-Lite; W-L., Ward-Leonard; Dyn., Dyneto; N. E., North East; L-N., Leece-Neville; A-C., Allis-Chalmers; Split., Splitdorf; S-H., Simms-Huff; G. & D., Gray & Davis. **Ignition**—A-K., Atwater-Kent; Conn., Connecticut; Eise., Eisemann; West., Westinghouse; Will., Willard; N. E., North East; K-Remy, Kingston-Remy; Berl., Berling; Bosch-W., Bosch-Westinghouse; Split., Splitdorf. **Gearset**—G-L., Grant-Lees; North., Northway; B-L., Brown-Lipe. **Rear Axle**—Col., Columbia; W-Weiss, Walker-Weiss; C-Timk., Cadillac-Timken; West-Mott, Weston-Mott. **Universals**—Hart., Hartford; Ther-H., Thermoid-Hardy; U. M. Co., Universal Machine Co. **Speedometer**—J-Man., Johns-Manville; V-Sicklen, Van Sicklen; A-C., Allis-Chalmers.

Motor Age Monthly Passenger Car Specification Tables

These prices apply to five and seven-passenger models only.

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. C. H.P.	Carburetor Size and Make	Gear Ratio	Clutch	Gearset	Universals	Rear Axle	Steering Gear	Speedometer	Rims	Battery Volts	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model
Nash 681	5	1595	121	33x4	optional	3¼x5½	Own	6	25.35	1½—Mar.	4.50	B. and B.	Own	Own	Own	Gemmer	Stewart	Firestone	6	100	Willard	Wagner	Wagner	Wagner	6	Nash 681
Nash 682	7	1765	127	34x4½	optional	3¼x5½	Own	6	25.35	1½—Mar.	4.50	B. and B.	Own	Own	Own	Gemmer	Stewart	optional	6	100	Willard	Wagner	Wagner	Wagner	6	Nash 682
National Sextet BB	7	3500	130	32x4½	optional	3½x5½	Own	6	29.40	1½—Ray.	4.08	B. and B.	B-L	Arvac	Col.	Warner	Warner	Firestone	6	110	Prest.	West.	West.	Delco	6	National Sextet BB
Nelson D	5	1700	104	32x4	Goodyear	3⅛x4⅜	Own	4	15.63	1—Zen.	4.25	Own	Own	Own	Own	Stewart	Kelsey	12	72	Willard	U. S. L.	U. S. L.	Bosch	12	Nelson D
Noma 1-B	4	2900	128	32x4½	Goodyear	3¼x4½	Cont.	6	25.35	1½—Zen.	4.45	B. and B.	Detroit	Spicer	Timken	Lavine	Stewart	Houk	6	104	Willard	Delco	Delco	Delco	6	Noma 1-B
Oakland 34-C	5	1235	115	32x4	Goodyear	2 1/16x4⅜	Own	6	18.99	1—Mar.	4.50	Own	Muncie	Mechanics	Buick	Jacox	Stewart	Jaxon	6	85	Prest.	Remy	Remy	Remy	6	Oakland 34-C
Ogren 6-60	6	3250	134	33x5	Goodyear	3½x5½	Conn.	6	33.75	1½—Opt.	.....	B-L	B-L	Arvac	Timken	Own	Warner	Firestone	6	120	Willard	West.	West.	Bosch	6	Ogren 6-60
Oldsmobile 37-A	5	1450	112	32x4	Goodyear	2 1/16x4⅜	Own	6	18.99	1½—John.	4.58	Own	Warner	Spicer	West. Mott	Jacox	Stewart	Jaxon	6	80	Willard	Remy	Remy	Remy	6	Oldsmobile 37-A
Oldsmobile 45-B	7	2045	122	33x4½	Goodyear	2⅞x4⅜	Own	8	26.45	1½—Ball	4.91	Own	Warner	Spicer	West-Mott	Jacox	Stewart	Jaxon	6	.....	Willard	Delco	Delco	Delco	6	Oldsmobile 45-B
Olympian 45	5	1240	112	32x3½	Miller	3¼x4½	Own	4	16.90	1¼—Strom.	.....	B. and B.	Own	.....	Peru	Warner	Stewart	Perlman	6	.....	U. S. L.	A-L	A-L	Conn.	6	Olympian 45
Overland 4	5	945	100	30x3½	Fisk	3⅜x4	Own	4	18.23	1—Tillot. #	4.50	B. and B.	Own	Own	Own	Own	Stewart	Stanweld	....	80	U. S. L.	A-L	A-L	Conn.	6	Overland 4
Owen-Magnetic W-42	7	7000	142	35x5	optional	4x5½	Weid.	6	38.46	—Zen.	.....	Own	Own	Spicer	Amer.	Own	Warner	Firestone	24	.....	Willard	Own	Own	Bosch	28	Owen-Magnetic W-42
Packard Twin Six	7	....	136	35x5	optional	3x5	Own	12	43.20	—Own*	4.36	Own	Own	Spicer	Own	Own	Waltham	Firestone	6	120	Willard	Bijur	Bijur	Delco	7	Packard Twin Six
Paige 6-42	5	1770	119	32x4	optional	3¼x5	Own	6	23.44	1—Strom.	4.50	B. and B.	Own	Detroit	Salisbury	Jacox	Stewart	Kelsey	6	108	Willard	G. & D.	G. & D.	A-K	6	Paige 6-42
Paige 6-55	7	2400	127	33x4½	optional	3⅜x5½	Cont.	6	29.40	1¼—Ray.	4.33	B. and B.	Own	Spicer	Salisbury	Jacox	Stewart	Kelsey	6	108	Willard	G. & D.	G. & D.	A-K	6	Paige 6-55
Paragon	.....	.....	122	.....	.....	3⅜x5⅛	.....	4	22.50	.....	4.25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Paragon
Parenti	5	1685	123	32x4	.....	3x4½	Cameron	6	21.60	—Zen.	.....	B. and B.	Cameron	.....	Own	Own	Stewart	Jaxon	6–8	84	U. S. L.	Bijur	Bijur	Conn.	.....	Parenti
Paterson 6-47	7	1725	120	33x4	optional	3¼x4½	Cont.	6	25.35	1½—Strom.	4.50	B. and B.	Durston	Hartford	Stan-Par.	Jacox	Stewart	Jaxon	6	80	Willard	Delco	Delco	Delco	6	Paterson 6-47
Peerless Series 6	7	3050	125	34x4	Goodyear	3¼x5	Own	8	33.80	1⅛—Ball.	4.54	Own	Own	.....	Own	Gemmer	V. Sicklen	Firestone	6	125	Willard	A-L	A-L	A-K	6	Peerless Series 6
Phianna R	5	9500	125	32x4½	U. S.	3 3/32x6	Own	4	24.70	1½—Strom.	.....	Own	Own	Own	Amer.	Own	Warner	Firestone	6	.....	Willard	W-L	W-L	Bosch	6	Phianna R
Piedmont 4-30	5	1395	116	32x3½	Firestone	3¼x5	Lyc.	4	19.60	1—Carter	4.45	B. and B.	G-L	Hartford	Peru	Ditweiler	Stewart	Firestone	6	90	Willard	Delco	Dyn.	Delco	6	Piedmont 4-30
Piedmont 6-49	5	1865	122	32x4	Firestone	3¼x4½	Cont.	6	25.35	1—Strom.	4.45	B. and B.	G-L	Hartford	Timken	Warner	Stewart	Firestone	6	90	Willard	Remy	Remy	Remy	6	Piedmont 6-40
Pierce-Arrow 38	7	7250	134	34x4½	Goodrich	4x5½	Own	6	38.40	—Own	3.78	Own	Own	Own	Own	Own	Waltham	Goodrich	6–8	135	.....	West.	West.	Delco	6	Pierce-Arrow 38
Pierce-Arrow 48	7	7750	142	35x5	Goodrich	4¼x5½	Own	6	48.60	—Own	3.53	Own	Own	Own	Own	Own	Waltham	Goodrich	6–8	135	.....	West.	West.	Delco	6	Pierce-Arrow 48
Pilot 6-45	5	1650	120	32x4	Miller	3¼x5	Teetor	6	23.44	1—Tillot.	4.90	B. and B.	Muncie	Hart	Spacke	Ditweiler	Stewart	Standard	6	100	Prest.	Delco	Delco	Delco	6	Pilot 6-45
Porter 46	7	9400	142	35x5	U. S.	4.6x6⅜	Own	4	34.18	2½—Zen.	3.00	M. and E.	Own	.....	Own	Own	Stewart	Firestone	12	118	Prest.	West.	West.	Berl.	12	Porter 46
Premier 6-D	7	4300	126½	32x4½	Firestone	3⅜x5½	Own	6	27.34	1¼—John.	4.50	B. and B.	Own	Peters	Stan-Par.	Warner	Own	Firestone	6	120	Willard	Delco	Delco	Delco	6	Premier 6-D
Reo T-6	5	1750	120	33x4	U. S.	3 3/16x5	Own	6	24.30	1½—Ray.	4.66	Own	Own	Own	Own	Own	Stewart	Firestone	6	115	Willard	N. E.	N. E.	N. E.	6	Reo T-6
ReVere C	7	4250	131	32x4½	optional	4¼x6	Monsen	4	30.63	1¾—Strom.	3.44	B-L	B-L	Spicer	Standard	Gemmer	Stewart	Houk	6	120	Willard	West.	West.	Bosch	6	ReVere C
Roamer C-6-54	7	3075	128	32x4½	Goodyear	3½x5½	Cont.	6	26.40	1¼—Strom.	.....	B. and B.	G-L	Ther-H	Stan-Par.	Jacox	Warner	Stanweld	6	90	Col.	Bijur	Bijur	Bosch	6	Roamer C-6-54
R & V Knight J	7	3150	127	32x4½	optional	3¼x4½	Own	6	29.40	1¼—Strom	4.90	B. and B.	B-L	Spicer	Timken	Jacox	Stewart	Firestone	6	117	Willard	Wagner	Wagner	Wagner	6	R & V Knight J
R & V Knight R	5	2150	115	32x4	optional	3¼x5	Own	4	22.50	1¼—Strom	4.75	B. and B.	B-L	Spicer	Salisbury	Jacox	Stewart	Firestone	6	117	Willard	Wagner	Wagner	Wagner	6	R & V Knight R
Saxon	5	1785	112	32x4	.....	3⅛x5	Own	4	18.23	1¼—Strom.	4.75	Own	Own	Own	Own	Own	Stewart	Firestone	6	80	Prest.	Wagner	Wagner	Wagner	6	Saxon
Sayers Six	5	2095	118	33x4	Goodyear	3¼x4½	Cont.	6	25.35	1—Strom.	.....	B. and B.	G-L	Arvac	Stan-Par.	Warner	Stewart	Firestone	6	80	Willard	Delco	Delco	Delco	6	Sayers Six
Scripps-Booth B-39	5	1425	115	32x4	Goodyear	2 1/16x4⅜	North.	6	18.99	1—Mar.	4.50	North.	Warner	Peters	West-Mott	Jacox	Stewart	Kelsey	6	85	Prest.	Remy	Remy	Remy	6	Scripps-Booth B-39
Seneca L	5	1185	108	30x3½	Miller	3¼x4½	Le Roi	4	15.63	1—Scheb.	4.50	B. and B.	Warner	.....	Peru	Ditweiler	Stewart	Jackson	6	88	Prest.	A-C	A-C	Conn.	6	Seneca L
Severin H	5	2400	122½	32x4½	Miller	3½x5¼	Cont.	6	29.40	—Strom.	4.50	B. and B.	Muncie	Peters	Salisbury	Lavine	Stewart	Firestone	6	110	Camp.	Wagner	Wagner	Wagner	6	Severin H
S. G. V.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	S. G. V.
Shaw	7	5000	136	33x5	Firestone	4¼x6	Roch.	4	28.90	—Strom.	.....	B-L	B-L	.....	Timken	Jacox	Warner	.....	.....	.....	.....	West.	West.	Bosch	.....	Shaw
Singer 20	7	5800	108	33x5	Goodyear	2⅞x5	Weid.	12	39.68	1½—Strom.	3.77	Covert	Covert	Spicer	Timken	Ross	Stewart	Own	6	162	Willard	West.	West.	Phil.	6	Singer 20
Skelton	5	1245	112	32x3½	optional	3½x5	Lycoming	4	19.60	1—Carter	4.25	B. and B.	Muncie	Universal	Peru	C. A. S.	Stewart	Stanweld	6	85	Prest.	West.	West.	Conn.	6	Skelton
Spacke S-20	2	295	90	28x3	U. S.	3½x3.67	Own	2	9.80	1—Carter #	5.09	Own	Own	.....	Own	Own	.....	.....	.....	.....	.....	.....	.....	A-K	.....	Spacke S-20
Standard 8-I	7	3400	127	34x4½	optional	3½x5	Own	8	33.80	1¼—Zen.	4.45	B. and B.	G-L	Arvac	Timken	Gemmer	Stewart	Firestone	6	160	Willard	West.	West.	Opt.	6	Standard 8-I
Stanwood	.....	....	118	.....	.....	.....	Cont.	6	.....	—Strom.	.....	B. and B.	G-L	.....	Stan-Par.	Gemmer	.....	.....	.....	.....	.....	West.	West.	A-K	.....	Stanwood
Stearns SKL-4	5	2450	125	34x4½	Goodrich	3⅜x5⅝	Own	4	22.50	1¼—Scheb.	4.50	Own	Own	Spicer	Own	V. Sicklen	Firestone	12	65	Willard	West.	West.	A-K	12	Stearns SKL-4
Stephens 80	6	2250	122	33x4½	Fisk	3¼x4½	R & V	6	25.35	1¼—Tillot.	4.75	B. and B.	Mechanics	Mechanics	Stan-Par	C. A. S.	Stewart	Stanweld	6–8	116	U. S. L.	A-L	A-L	A-L	6	Stephens 80

Engines—Ruten., Rutenber; Cont., Continental; Weid., Weidely; North., Northway; H-S., Herschell-Spillman; Lyco., Lycoming; D-Lyco., Dort-Lycoming; G. B. & S., Golden, Belknap & Swartz; T-McTeetor-McFarlan; #, Monson or Duesenberg; R. & V., Root & Van Dervoort. **Carburetor**—Strom., Stromberg; Zen., Zenith; Ray., Rayfield; John., Johnson; Mar., Marvel; Sund., Sunderman; Stew. Stewart; H-K., Holley-Kingston; Newc., Newcomb; Scheb., Schebler; Tillot., Tillotson; Johns., Johnston. Fuel feed vacuum except where otherwise indicated. *Pressure. #Gravity. **Generator and Motor**—A-L., Auto-Lite; West., Westinghouse; #, Westinghouse or Auto-Lite; W-L., Ward-Leonard; Dyn., Dyneto; N. E., North East; L-N., Leece-Neville; A-C., Allis-Chalmers; Split., Splitdorf; S-H. Simms-Huff; G. & D., Gray & Davis. **Ignition**—A-K., Atwater-Kent; Conn., Connecticut; Eise., Eisemann; West., Westinghouse; Will., Willard; N. E., North East; K-Remy, Kingston-Remy; Berl., Berling; Bosch-W., Bosch-Westinghouse; Split., Splitdorf. **Gearset—Speedometer**—J-Man. Johns-Manville; V-Sicklen Van Sicklen; G-L., Grant-Lees; North., Northway; B-L., Brown-Lipe. **Rear Axle**—Col. Columbia; W-Weiss Walker-Weiss; C-Timk. Cadillac-Timken; West-Mott Weston-Mott. **Universals**—Hart. Hartford; Ther-H Thermoid-H eady; U. M. Co. Universal Machine C A-C. Allis-Chalmers.

STEAM CARS

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. C. HP.	Carburetor Size and Make	Gear Ratio	Clutch	Gearset	Universals	Rear Axle	Steering Gear	Speedometer	Rims	Battery Volts	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model
Stevens-Duryea	7	7000	138	35x5	optional	4½x5½	Own	6	47.25	.....	.....	Own	Own	Own	Own	Own	Waltham	Firestone	6	.....	.....	West.	West.	Berl.	6	Stevens-Duryea
Studebaker E-J	5	1435	112	32x4	.....	3½x4½	Own	6	23.44	—Strom.	4.55	Own	Own	.....	Own	Own	V. Sicklen	Kelsey	6	80	Willard	Wagner	Wagner	Remy	6	Studebaker E-J
Studebaker E-G	7	2250	126	33x4½	Goodyear	3½x5	Own	6	36.04	—Ball.	3.70	Own	Own	Spicer	Own	Own	V. Sicklen	Kelsey	6	80	Willard	Wagner	Wagner	Delco	6	Studebaker E-G
Studebaker E-H	5	1785	119	32x4	.....	3½x5	Own	4	30.63	1½—Strom.	3.50	Own	Own	Spicer	Own	Gemmer	Warner	.....	6	130	Willard	Remy	Remy	Delco	6	Studebaker E-H
Stutz H	6	3600	130	32x4½	optional	3½x6	Own	4	18.23	1½—Strom.*	4.40	B. and B.	Detroit	Hardy	American	C. A. S.	Stewart	Firestone	6	100	.....	Bijur	Bijur	Simms	6	Stutz H
Templar A-445	5	2085	118	32x4	optional	3½x5½	Own	4	19.60	—Cor.	.....	B. and B.	G-L	Detroit	Peru	C. A. S.	Stewart	Firestone	6	80	Prest.	Bijur	Dyn.	Conn.	6	Templar A-445
Texan B-38	5	1395	115	33x4	Southland	3½x5	Lyc.	4	19.60	—Zen.	4.50	B. and B.	Munetie	.....	Salisbury	Gemmer	Stewart	Stanweld	6	80	Exide	Dyn.	Bijur	Conn.	6	Texan B-38
Tulsa E	5	1445	117½	33x4	Firestone	5x3½	H-S	4	19.60	1½—Zen.	4.50	B. and B.	Durston	Arvac	Timken	Gemmer	V. Sicklen	Firestone	6	120	Willard	Bijur	Bijur	A-K	6	Tulsa E
Velie 48	5	1885	115	32x4	Goodyear	3½x4½	Cont.	6	25.35	1½—Ray.	4.66	B. and B.	Durston	Arvac	Timken	Gemmer	V. Sicklen	Firestone	6	100	Willard	West.	West.	A-L	6	Velie 48
Velie 34	5	1485	112	32x3½	optional	3½x4½	Falls	6	24.44	—Ray.	4.60	B. and B.	Durston	Arvac	Col.	Gemmer	V. Sicklen	Firestone	6	108	Willard	A-L	A-L	Conn.	6	Velie 34
Vogue 6-55	5	2295	124	32x4	Goodrich	3½x5	H-S	6	25.35	—Scheb.	4.50	B. and B.	Warner	Norwalk	Salisbury	Ditweiler	Stewart	Firestone	6	108	Willard	A-L	A-L	Conn.	6	Vogue 6-55
Vogue 6-66	5	2485	124	33x4½	Goodrich	3½x5½	Cont.	6	29.40	—Scheb.	4.50	B. and B.	Warner	Norwalk	Salisbury	Ditweiler	Stewart	Firestone	6	108	Willard	A-L	A-L	Conn.	6	Vogue 6-66
Wasp	4	5000	132	33x5	Firestone	4½x5½	Wis.	4	36.10	1½—Strom.	3.10	.....	Covert	Spicer	Timken	Gemmer	V. Sicklen	Firestone	6	145	Exide	West.	West.	Bosch	6	Wasp
Westcott C-38	5	2490	118	33x4	Firestone	3½x4½	Cont.	6	25.35	1½—Ray.	5.09	B. and B.	Warner	Peters	Timken	Gemmer	V. Sicklen	Firestone	6	117	Willard	Deleo	Deleo	Deleo	6	Westcott C-38
Westcott C-48	7	2990	125	32x4½	Firestone	3½x5½	Cont.	6	29.40	1½—Ray.	4.45	B. and B.	B-L	Peters	Timken	Gemmer	V. Sicklen	Firestone	6	117	Willard	Deleo	Deleo	Deleo	6	Westcott C-48
Willys-Knight 20	5	1975	118	33x4	Fisk	3½x4½	Own	4	21.03	1—Tillot.*	.....	B. and B.	Own	Ther-H.	Own	Own	Stewart	Stanweld	6	170	U. S. L.	A-L	A-L	Conn.	6	Willys-Knight 20
Winther 61	5	....	120	33x4	Goodyear	3½x5	H-S	6	25.35	1½—Strom.	4.50	Warner	Own	Peters	Spacke	Lavine	Stewart	Firestone	6	127	Willard	West.	West.	West.	6	Winther 61
Winton 25	7	4250	132	35x5	optional	3½x5½	Own	3	33.75	1½—Strom.	4.90	.....	.....	.....	.....	.....	Warner	Firestone	6	120	Willard	Bijur	Bijur	Bosch	6	Winton 25
Stanley 735-B	7	4275	130	34x4½	Goodyear	4-5	Own	2	.....	none	none	none	none	.....	Own	.....	V. Sicklen	Firestone	6	116	Willard	Remy	None	None	6	Stanley 735-B

Engines—Ruten., Rutenber; Cont., Continental; Weid., Weidely; North., Northway; H-S., Herschell-Spillman; Lyco., Lycoming; D-Lyco., Dort-Lycoming; G. B. & S., Golden, Belknap & Swarts; T-McTeetor-McFarlan; #, Monson or Duesenberg; R. & V., Root & Van Dervoort. **Carburetor**—Strom., Stromberg; Zen., Zenith; Ray., Rayfield; John., Johnson; Mar., Marvel; Sund., Sunderman; Stew. Stewart; H-K., Holley-Kingston; Newe., Newcomb Scheb., Schebler; Tillot., Tillotson; Johns., Johnston. Fuel feed vacuumexcept where otherwise indicated. *Pressure. #Gravity. **Generator and Motor**—A-L, Auto-Lite; West., Westinghouse; #, Westinghouse or Auto-Lite; W-L., Ward-Leonard; Dyn., Dyneto; N. E., North East; L-N., Leece-Neville; A-C., Allis-Chalmers; Split., Splitdorf; S-B., Simms-Huff; G. & D., Gray & Davis. **Ignition**—A-K., Atwater-Kent; Conn., Connecticut; Else., Eisemann; West., Westinghouse; Will., Willard; N. E., North East; K-Remy, Kingston-Remy; Berl., Berling; Bosch-W., Bosch-Westinghouse; Split., Splitdorf. **Gearset**—G-L., Grant-Lees; North., Northway; B-L., Brown-Lipe. **Rear Axle**—Col., Columbia; W-Weiss, Walker-Weiss; C-Timk., Cadillac-Timken; West-Mott, Weston-Mott. **Universals**—Hart., Hartford; Ther-H., Thermoid-Hardy; U. M. Co., Universal Machine Co. **Speedometer**—J-Man., Johns-Manville; V-Sicklen, Van Sicklen; A-C., Allis-Chalmers.

ORANGE GROVES OF POMONA, CAL., DETERMINE TRACTOR TYPES

(*Continued from page 20*)

Hinman in merchandising the Fageol. This tractor, as will be noted in the illustration, has a peculiar spiked wheel. It is claimed that the effect of this wheel in the dusty orchards is that it does not raise the dirt and does not create the amount of dust which the paddle like grousers, mostly six inches in width, on other tractor wheels do. Observation seems to confirm this assertion. In so far the Fageol seems to be side-stepping a part of the dust problem. Also it has a peculiar air cleaner of its own which is put out as standard equipment.

Tractors work in the orchards every month in the year. For instance, where cover crops are sown, the work must be done in the spring. Then cultivation commences and this must be done as soon after irrigation as possible. Evidently this all is emergency work for which the tractor is peculiarly adapted. Then labor is a big factor. Help out here easily commands $100 a month and board and is hard to get at that. As one small tractor will do the work of from four to eight horses it is apparent how great an assistance it is in such an emergency. In short, the whole tractor situation in the citrus section of Southern California is one big emergency. This fact, too, merely emphasizes the demand for prompt and efficient service, and is the incentive behind the preparations made by the Pomona dealers to give such service.

The manner in which Hinman, for instance, is meeting this emergency, is typical. In this connection, too, it is interesting to know that the service policy which the Samson Tractor Co. announced some months ago will be adhered to rigidly in Southern California.

Pomona Typical of Entire Region

The interesting fact about the tractor situation at Pomona is that here is a locality which demands a highly specialized tractor and equipment to do highly specialized work. In accomplishing this peculiar and distinct problems are encountered. These are being worked out on the ground by men who know what they must do and who are outfitting themselves to do just that thing. And in this connection it is interesting and significant that the men who are engaged in this work are either out and out automotive dealers or men who are practically exclusive dealers in power farm operative equipment. And what is true of Pomona is true of a majority of the points from which tractors are retailed throughout the citrus fruit regions of Southern California. For this reason the situation at Pomona has been gone into somewhat more in detail than the importance of the place really warrants. But being typical, what has been said of it may stand as substantially true for all other similar points throughout this entire region.

From the Four Winds

Glimpses at the World of Motordom

Coming Motor Events

AUTOMOBILE SHOWS

Anaheim, Cal.	First Annual Show Orange County Automobile Trade Ass'n	May 5-8
Macon, Ga.	Macon Automobile Dealers' Ass'n	May 6 to 8
Northampton, Mass.	Annual Automobile Show	Oct. 6-8

FOREIGN SHOWS

Antwerp	Cars, Tires, Wheels, Parts and Equipment	May 15-June 13
Antwerp	Commercial Vehicles, Tractors, Trucks and Engines	June 26-July 25
Antwerp	Motorcycles, Side Cars, Parts and Equipment	Aug. 7-Sept. 15
London, Eng.	Commercial Vehicles Exhibition, Olympia	October
London	Passenger Car Show, Olympia	November

CONVENTIONS

Charleston, S. C.	South Carolina Automotive Trade Ass'n	June 24, 25

RACES

Indianapolis	500-Mile Speedway Race	May 31
Uniontown, Pa.	Speedway Race	June 12
Tacoma, Wash.	Speedway Race	July 5
Paris, France	Grand Prix Race, Sporting Commission	August
Cincinnati, O.	Speedway Race	Sept. 6
Uniontown, Pa.	Speedway Race	Sept. 6

TOURS

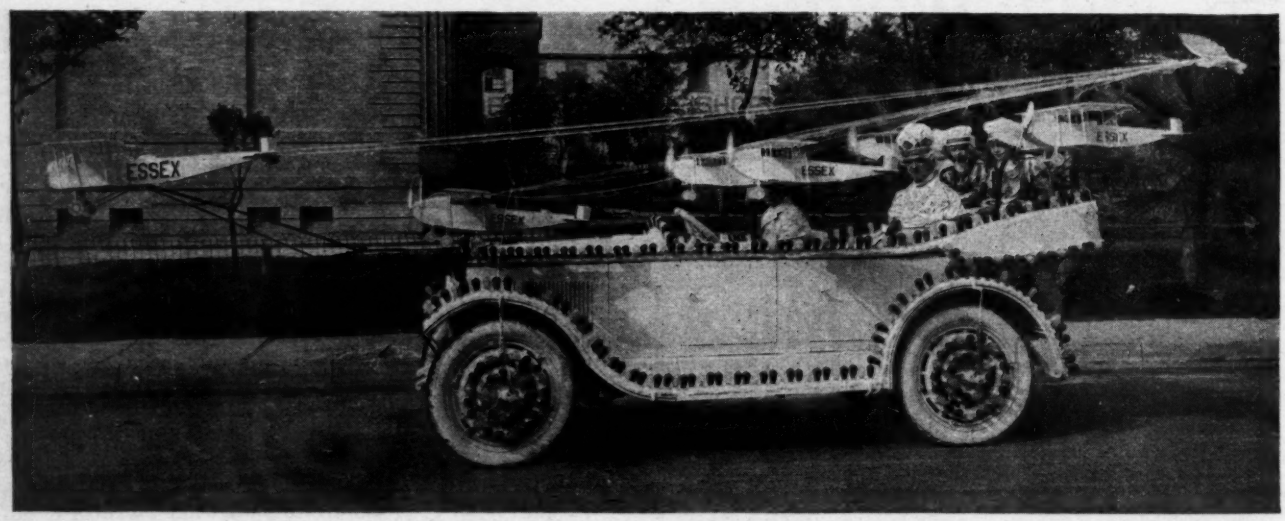
Atlanta, Ga.	Truck Tour	May 17-22
Omaha, Neb.	Truck Reliability Run	June 1
Milwaukee, Wis.	Wisconsin Truck Tour, Milwaukee Sentinel	June 21-26
Lake Huron Tour	Michigan Pikes Ass'n	July 4
New York-San Francisco	Glidden Tour	September

Ohio Issues 500,000 Licenses—The Automobile Department has issued approximately 500,000 sets of number plates for 1920 registration. This covers passenger cars, trucks and manufacturers and dealers. While the department is not ready to make a detailed report because of the large number of branch distributing agencies which have not reported, it is estimated that approximately 440,000 passenger cars have been registered; 35,000 trucks and a large number of dealers and manufacturers. About 70,000 more sets of number plates have been ordered and this may not be sufficient to take care of the applications. It is believed that the registration of passenger cars alone will amount to 540,000 for the year 1920.

Ingratitude—A Hartford, Conn., tire repair man believes that he met the meanest man in the country a few days ago when he changed tires for him in a heavy downpour just to be accommodating. In his hurry to get the tires on the repair man accidentally caught one of his fingers on the rim, smashing the bone and taking away some of the flesh. And for all this free service he got not even sympathy but rather was the target for remarks that would not look well in print. So he wonders if there is anything in the free service proposition after all.

Cleans Crankcase Gratis—A new angle on free service is provided by the inauguration of a crankcase cleaning proposition advanced by the Arrow Oil Co., which does a sizeable business in gasoline and oil at Hartford, Conn. This concern has advertised its willingness to clean out the crankcases of all cars with kerosene and put in new oil merely charging the car owner for the new oil. In addition the firm has set aside free parking space in the center of the city for its customers. And of course there are other conveniences such as water and air at the disposal of car users. The crankcase innovation is bringing in business.

Building Canadian Truck Factory—No one can estimate the number of motor trucks that will be used here in Ontario five years from now. In speaking with Frank O'Madden, distributor of the Fulton truck in Toronto, he stated that arrangements have been completed for a Canadian factory to manufacture the Fulton 1½ ton car. Already there are about six firms manufacturing motor trucks in Ontario, and several others are expected to follow the decision of the Fulton Motor Truck Co., New York.



At first glance this may look like a flock of airplanes towing a car, but it's the Essex which took first prize in a recent Flower Carnival at San Antonio, Tex., and being the best looking was used as the King's vehicle. Realistic effect is given to the small airplanes by reason of the revolving propellors. The lights are red and blue, alternately and against the white background of the car present the national colors